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Patentanmeldung Nr. Patent application No. Demande de brevet n°

98811035.9

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For the President of the European Patent Office

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**Blatt 2 der Bescheinigung  
Sheet 2 of the certificate  
Page 2 de l'attestation**

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Colour Photographic Material

The present invention relates to colour photographic material comprising a certain lacton (benzofuran-2-one) type compound, to the use thereof as scavenger for the oxidised form of the developer (Dox-scavenger), some new compounds of the benzofuran-2-one class, and their use as stabilisers for organic material against oxidative, thermal and/or light-induced degradation.

It is well known that one of the problems associated with colour photography is the diffusion of the oxidised colour developer away from the light sensitive silver halide emulsion layer in which it is formed into another silver halide emulsion layer, which can result in the formation of unwanted dyes at undesired places. For instance, while being generated in the green sensitive layer and forming a magenta dye through a coupling reaction with the incorporated magenta coupler, the oxidised developer can also diffuse to the red sensitive layer thereby producing unwanted cyan dye or to the blue sensitive layer thereby producing unwanted yellow dye. This kind of colour formation in the wrong layers will damage the colour balance of the photographic image and thus result in poor colour reproduction. One way of circumventing this problem is to incorporate oxidised developer scavengers in interlayers between the light sensitive silver halide emulsion layers. These scavengers should have additional properties such as low tendency to migrate, good stability towards aerial oxidation and high solubility in photographic oils.

Several classes of compounds that are useful as scavengers for oxidised developers are known in literature, e.g. specific derivatives of hydroquinone (US-2336327, US-2732300, US-3700453, US-4345016, JP-A 83-021249, JP-A 86-083 536 and JP-A 88-046 451); hydrazines (EP-A-338 785, EP-A-679 944, US-4923 787); sulphonamidophenol (EP-A-654702, US-4447523, JP-A 85-118 835); gallic acid (US-4476219, US-4474874, JP-A 93-002 249, JP-A 86-083 536); resorcinol (US-3770431, US-3772014); catechol (US-4175969, US-4252893, EP-A-727706); aminophenol or aminonaphthol (RD 178, 94-7,1979); natural antioxidants such as vitamin E or vitamin C (US-2360290, US-2710801).

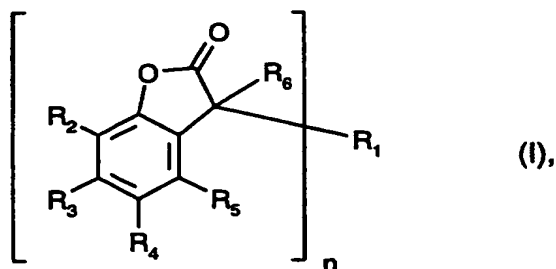
Photographic material containing a benzofuran-2-one is mentioned in US-3615521 (use as precursor of photographic developing agent) and in US-4366240 (hydroxy substituted compounds as electron donor precursors for reducible color providing compounds). A

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defensive publication US 904 003 (19.11.1971) discloses some aryl-benzofuran-2-ones as competitive couplers for use in photographic developer compositions or in light sensitive silver halide emulsion layers. DE-A-197 49 083 mentions the use of a symmetrically substituted 3-(2-hydroxyphenyl)-benzofuran-2-one in the interlayer of a colour photographic material.

It has now been found that certain compounds of the 3-aryl-benzofuran-2-one class are especially effective as scavengers for the oxidised developer (also termed hereafter Dox scavenger). These compounds are also very stable towards aerial oxidation, diffusion fast and exhibit a good solubility in high boiling photographic oils. They are well suited for use in photographic elements containing pyrazolotriazole couplers as magenta dye providing compounds, since they are harmless to the light fastness of stabilised magenta images obtained from such pyrazolotriazole couplers when compared to hydroquinones.

Subject of the invention is therefore a photographic material containing a compound of the formula I

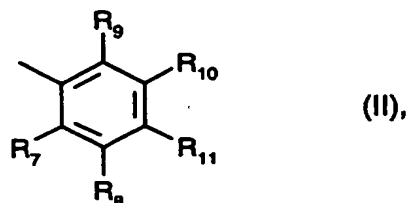


wherein, if  $n = 1$ ,

$R_1$  is naphthyl, phenanthryl, anthryl, 5,6,7,8-tetrahydro-2-naphthyl, 5,6,7,8-tetrahydro-1-naphthyl, thienyl, benzo[b]thienyl, naphtho[2,3-b]thienyl, thianthrenyl, dibenzofuryl, chromenyl, xanthenyl, phenoxathiinyl, pyrrolyl, imidazolyl, pyrazolyl, pyrazinyl, pyrimidinyl, pyridazinyl, indoliziny, isoindolyl, indolyl, indazolyl, purinyl, quinoliziny, isoquinolyl, quinolyl, phthalaziny, naphththyridinyl, quinoxalinyl, quinazolinyl, cinnolinyl, pteridinyl, carbazolyl,  $\beta$ -carbolinyl, phenanthridinyl, acridinyl, p rimidinyl, phenanthrolinyl, phenazinyl, isothiazolyl, phenothiazinyl, isoxazolyl, furazanyl, biphenyl, terphenyl, fluorenyl or phenoxazinyl, each of which is

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unsubstituted or substituted by C<sub>1</sub>-C<sub>4</sub>alkyl, C<sub>1</sub>-C<sub>4</sub>alkoxy, C<sub>1</sub>-C<sub>4</sub>alkylthio, hydroxy, halogen, amino, C<sub>1</sub>-C<sub>4</sub>alkylamino, phenylamino or di(C<sub>1</sub>-C<sub>4</sub>-alkyl)amino, or R<sub>1</sub> is a radical of formula II



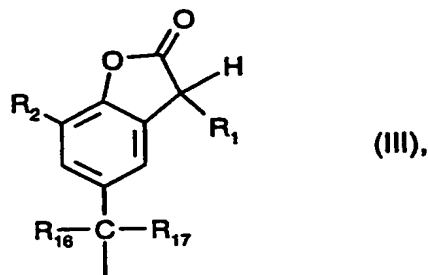
and, if  $n = 2$ ,

R<sub>1</sub> is unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl- or hydroxy-substituted phenylene or naphthylene; or -R<sub>12</sub>-X-R<sub>13</sub> ,

R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub> and R<sub>5</sub> are each independently of one another hydrogen, chloro, hydroxy, C<sub>1</sub>-C<sub>25</sub>-alkyl, C<sub>7</sub>-C<sub>9</sub>phenylalkyl, unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl-substituted phenyl; unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl-substituted C<sub>5</sub>-C<sub>8</sub>cycloalkyl; C<sub>1</sub>-C<sub>18</sub>alkoxy, C<sub>1</sub>-C<sub>18</sub>alkylthio, C<sub>1</sub>-C<sub>4</sub>alkylamino, di(C<sub>1</sub>-C<sub>4</sub>-alkyl)amino, C<sub>1</sub>-C<sub>25</sub>alkanoyloxy, C<sub>1</sub>-C<sub>25</sub>alkanoylamino, C<sub>3</sub>-C<sub>25</sub>alkenoyloxy;

C<sub>3</sub>-C<sub>25</sub>alkanoyloxy which is interrupted by oxygen, sulfur or  $\text{>N-R}_{14}$  ; C<sub>6</sub>-C<sub>9</sub>cycloalkyl-

carbonyloxy, benzoyloxy or C<sub>1</sub>-C<sub>12</sub>alkyl-substituted benzoyloxy; or R<sub>2</sub> and R<sub>3</sub>, or R<sub>3</sub> and R<sub>4</sub>, or R<sub>4</sub> and R<sub>5</sub>, together with the linking carbon atoms, form a benzene ring; or R<sub>4</sub> is -C<sub>m</sub>H<sub>2m</sub>-COR<sub>15</sub> or -(CH<sub>2</sub>)<sub>q</sub>OH or, if R<sub>3</sub>, R<sub>5</sub> and R<sub>6</sub> are hydrogen, R<sub>4</sub> is additionally a radical of formula III

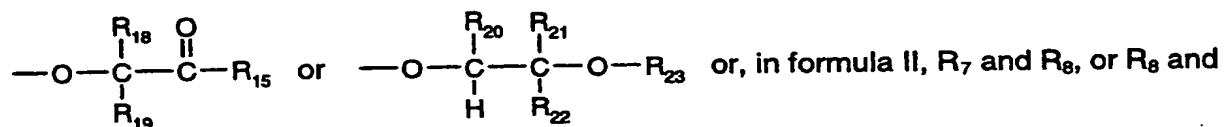


wherein R<sub>1</sub> is as defined above for  $n = 1$ ;

R<sub>6</sub> is hydrogen or, when R<sub>4</sub> is hydroxy, R<sub>6</sub> can also be C<sub>1</sub>-C<sub>25</sub>alkyl or C<sub>3</sub>-C<sub>25</sub>alkenyl;

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$R_7, R_8, R_9, R_{10}$  and  $R_{11}$  are each independently of one another hydrogen, halogen, hydroxy,  $C_1$ - $C_{25}$ alkyl;  $C_2$ - $C_{25}$ alkyl which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_1$ - $C_{25}$ alkoxy;  $C_2$ - $C_{25}$ alkoxy which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_1$ - $C_{25}$ alkylthio,  $C_3$ - $C_{25}$ alkenyl,  $C_3$ - $C_{25}$ alkenyloxy,  $C_3$ - $C_{25}$ alkynyl,  $C_3$ - $C_{25}$ alkynyloxy,  $C_7$ - $C_9$ phenylalkyl,  $C_7$ - $C_9$ phenylalkoxy, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenyl; unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenoxy; unsubstituted or  $C_1$ - $C_4$ alkyl-substituted  $C_5$ - $C_8$ cycloalkyl; unsubstituted or  $C_1$ - $C_4$ alkyl-substituted  $C_5$ - $C_8$ cycloalkoxy;  $C_1$ - $C_4$ alkylamino, di( $C_1$ - $C_4$ alkyl)amino,  $C_1$ - $C_{25}$ alkanoyl;  $C_3$ - $C_{25}$ alkanoyl which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_1$ - $C_{25}$ alkanoyloxy;  $C_3$ - $C_{25}$ alkanoyloxy which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_1$ - $C_{25}$ alkanoylamino,  $C_3$ - $C_{25}$ alkenoyl;  $C_3$ - $C_{25}$ alkenoyl which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_3$ - $C_{25}$ alkenoyloxy;  $C_3$ - $C_{25}$ alkenoyloxy which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_6$ - $C_9$ cycloalkylcarbonyl,  $C_6$ - $C_9$ cycloalkylcarbonyloxy, benzoyl or  $C_1$ - $C_{12}$ alkyl-substituted benzoyl; benzoyloxy or  $C_1$ - $C_{12}$ alkyl-substituted benzoyloxy;



$R_{11}$ , together with the linking carbon atoms, form a benzene ring,

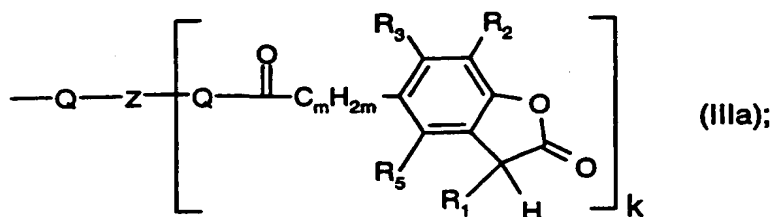
$R_{12}$  and  $R_{13}$  are each independently of the other unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenylene or naphthylene,

$R_{14}$  is hydrogen or  $C_1$ - $C_8$ alkyl,

$R_{15}$  is hydroxy,  $\left[ -O^- \frac{1}{r} M^{r+} \right]$ ,  $C_1$ - $C_{20}$ alkoxy,  $-N \begin{array}{l} R_{24} \\ R_{25} \end{array}$ , or a group of the formula IIIa



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$R_{16}$  and  $R_{17}$  are each independently of the other hydrogen,  $CF_3$ ,  $C_1$ - $C_{12}$ alkyl or phenyl, or  $R_{16}$  and  $R_{17}$ , together with the linking carbon atom, are a  $C_5$ - $C_8$ cycloalkylidene ring which is unsubstituted or substituted by 1 to 3  $C_1$ - $C_4$ alkyl;

$R_{18}$  and  $R_{19}$  are each independently of the other hydrogen,  $C_1$ - $C_4$ alkyl or phenyl,

$R_{20}$  is hydrogen or  $C_1$ - $C_4$ alkyl,

$R_{21}$  is hydrogen, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenyl;  $C_1$ - $C_{25}$ alkyl;  $C_2$ - $C_{25}$ alkyl

which is interrupted by oxygen, sulfur or  $\text{N}-R_{14}$ ;  $C_7$ - $C_9$ phenylalkyl which is unsubstituted or substituted at the phenyl moiety by 1 to 3  $C_1$ - $C_4$ alkyl;  $C_7$ - $C_{25}$ phenylalkyl which is

interrupted by oxygen, sulfur or  $\text{N}-R_{14}$  and which is unsubstituted or substituted at the

phenyl moiety by 1 to 3  $C_1$ - $C_4$ alkyl, or  $R_{20}$  and  $R_{21}$ , together with the linking carbon atoms,

form a  $C_5$ - $C_{12}$ cycloalkylene ring which is unsubstituted or substituted by 1 to 3  $C_1$ - $C_4$ alkyl;

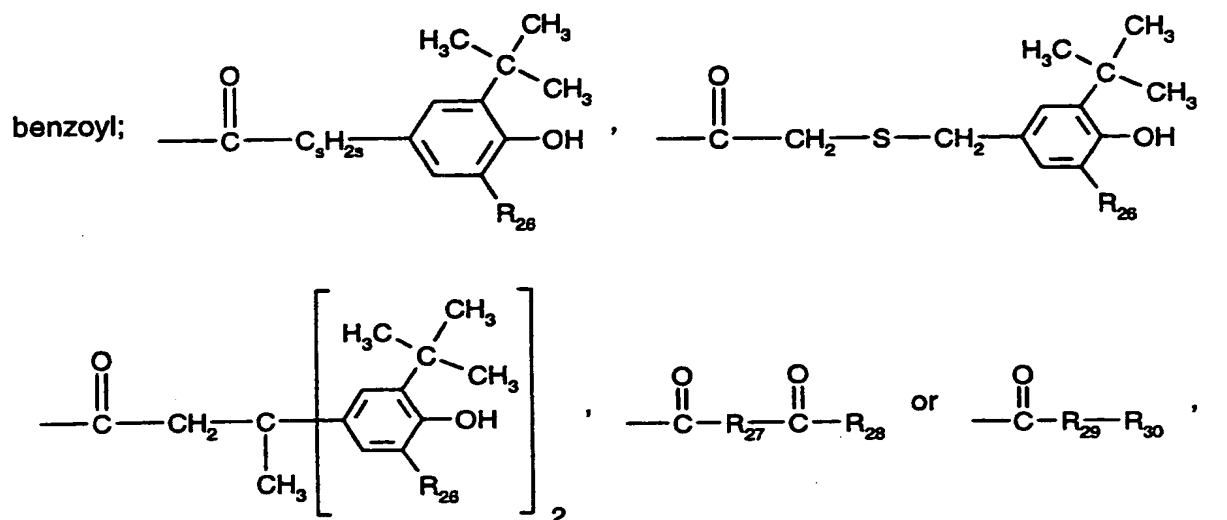
$R_{22}$  is hydrogen or  $C_1$ - $C_4$ alkyl,

$R_{23}$  is hydrogen,  $C_1$ - $C_{25}$ alkanoyl,  $C_3$ - $C_{25}$ alkenoyl;  $C_3$ - $C_{25}$ alkanoyl which is interrupted by

oxygen, sulfur or  $\text{N}-R_{14}$ ;  $C_2$ - $C_{25}$ alkanoyl which is substituted by a di( $C_1$ - $C_6$ alkyl)phos-

phonate group;  $C_6$ - $C_9$ cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or  $C_1$ - $C_{12}$ alkyl-substituted

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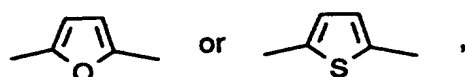
$R_{24}$  and  $R_{25}$  are each independently of the other hydrogen or  $C_1$ - $C_{18}$ alkyl,

$R_{26}$  is hydrogen or  $C_1$ - $C_8$ alkyl,

$R_{27}$  is a direct bond,  $C_1$ - $C_{18}$ alkylene;  $C_2$ - $C_{18}$ alkylene which is interrupted by oxygen, sulfur or

$\text{N---R}_{14}$  ;  $C_2$ - $C_{18}$ alkenylene,  $C_2$ - $C_{20}$ alkylidene,  $C_7$ - $C_{20}$ phenylalkylidene,  $C_5$ - $C_8$ cycloalkyl-

lene,  $C_7$ - $C_8$ bicycloalkylene, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenylene,



$R_{28}$  is hydroxy,  $\left[ \text{---O}^- \frac{1}{r} \text{M}^{r+} \right]$  ,  $C_1$ - $C_{18}$ alkoxy or  $\text{---N} \begin{matrix} R_{24} \\ R_{25} \end{matrix}$  ,

$R_{29}$  is oxygen or  $\text{---NH---}$ ,

$R_{30}$  is  $C_1$ - $C_{18}$ alkyl or phenyl,

$R_{31}$  is hydrogen or  $C_1$ - $C_{18}$ alkyl,

M is an r-valent metal cation,

Q is oxygen or  $\text{---NH---}$ ,

X is a direct bond, oxygen, sulfur or  $\text{---NR}_{31}\text{---}$  ,

Z is a linking group of valency (k+1) and is as a divalent group  $C_2$ - $C_{12}$ alkylene, Q-interrupted  $C_4$ - $C_{12}$ alkylene, phenylene or phenylene-D-phenylene with D being  $C_1$ - $C_4$ alkylene, O, S, SO or  $\text{SO}_2$ ;

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Z as a trivalent group is  $C_3$ - $C_{12}$ alkanetriyl, a trivalent residue of a hexose or a hexitol, a group  $(-CH_2)_3C-CH_2OH$ , or a group  $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}-$ ; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol,  $C_4$ - $C_{12}$ alkanetetryl,



a, b, c and k independently are 1, 2 or 3;

m is 0 or a number from the range 1-12, preferably 1-6;

n is 1 or 2;

q is 1, 2, 3, 4, 5 or 6;

r is 1, 2 or 3; and

s is 0, 1 or 2;

provided that, when  $R_7$  is hydroxy, alkanoyloxy or alkanoyloxy interrupted by O, S or  $N(R_{14})$  and  $R_9$  is hydrogen,  $R_{10}$  is not identical with  $R_4$ .

Further objects of the invention are the use of a compound of the formula I as Dox-scavenger in colour photographic material, and a process for preventing migration of the oxidised developer in a colour photographic material from one colour sensitive layer to another by incorporating a compound of the formula I into said material.

Preferred residues of the classes naphthyl, phenanthryl, anthryl, 5,6,7,8-tetrahydro-2-naphthyl, 5,6,7,8-tetrahydro-1-naphthyl, thienyl, benzo[b]thienyl, naphtho[2,3-b]thienyl, thianthrenyl, dibenzofuryl, chromenyl, xanthenyl, phenoxathiinyl, pyrrolyl, imidazolyl, pyrazolyl, pyrazinyl, pyrimidinyl, pyridazinyl, indiziny, isoindolyl, indolyl, indazolyl, purinyl, quinoliziny, isoquinolyl, quinolyl, phthalazinyl, naphthyridinyl, quinoxaliny, quiazoliny, cinnoliny, pteridinyl, carbazolyl,  $\beta$ -carboliny, phenanthridinyl, acridinyl, perimidiny, phenanthroliny, phenazinyl, isothiazolyl, phenothiazinyl, isoxazolyl, furazanyl, biphenyl, terphenyl, fluorenyl or phenoxazinyl, each of which is unsubstituted or substituted by  $C_1$ - $C_4$ alkyl,  $C_1$ - $C_4$ alkoxy,  $C_1$ - $C_4$ alkylthio, hydroxy, halogen, amino,  $C_1$ - $C_4$ alkylamino, phenylamino or di( $C_1$ - $C_4$ alkyl)amino are, for example, naphthyl, phenanthryl, anthryl, 5,6,7,8-tetrahydro-2-naphthyl, 5,6,7,8-tetrahydro-1-naphthyl, thienyl, benzo[b]thienyl, naphtho[2,3-b]thienyl, thianthrenyl, dibenzofuryl, chromenyl, xanthenyl, phenoxathiinyl, pyrrolyl, isoindolyl, indolyl,

phenothiazinyl, biphenyl, terphenyl, fluorenyl or phenoxazinyl, each of which is unsubstituted or substituted by C<sub>1</sub>-C<sub>4</sub>alkyl, C<sub>1</sub>-C<sub>4</sub>alkoxy, C<sub>1</sub>-C<sub>4</sub>alkylthio, hydroxy, phenylamino or di(C<sub>1</sub>-C<sub>4</sub>alkyl)amino, for example 1-naphthyl, 2-naphthyl, 1-phenylamino-4-naphthyl, 1-methylnaphthyl, 2-methylnaphthyl, 1-methoxy-2-naphthyl, 2-methoxy-1-naphthyl, 1-dimethylamino-2-naphthyl, 1,2-dimethyl-4-naphthyl, 1,2-dimethyl-6-naphthyl, 1,2-dimethyl-7-naphthyl, 1,3-dimethyl-6-naphthyl, 1,4-dimethyl-6-naphthyl, 1,5-dimethyl-2-naphthyl, 1,6-dimethyl-2-naphthyl, 1-hydroxy-2-naphthyl, 2-hydroxy-1-naphthyl, 1,4-dihydroxy-2-naphthyl, 7-phenanthryl, 1-anthryl, 2-anthryl, 9-anthryl, 3-benzo[b]thienyl, 5-benzo[b]thienyl, 2-benzo[b]thienyl, 4-dibenzofuryl, 4,7-dibenzofuryl, 4-methyl-7-dibenzofuryl, 2-xanthenyl, 8-methyl-2-xanthenyl, 3-xanthenyl, 2-pyrrolyl, 3-pyrrolyl, 2-phenothiazinyl, 3-phenothiazinyl, 10-methyl-3-phenothiazinyl.

Halogen is typically chloro, bromo or iodo. Chloro is preferred.

Alkanoyl of up to 25 carbon atoms is a branched or unbranched radical, typically formyl, acetyl, propionyl, butanoyl, pentanoyl, hexanoyl, heptanoyl, octanoyl, nonanoyl, decanoyl, undecanoyl, dodecanoyl, tridecanoyl, tetradecanoyl, pentadecanoyl, hexadecanoyl, heptadecanoyl, octadecanoyl, eicosanoyl or docosanoyl. Alkanoyl of 2 to 18, in particular of 2 to 12, e.g. of 2 to 6, carbon atoms is preferred. Acetyl is particularly preferred. C<sub>2</sub>-C<sub>25</sub>Alkanoyl which is substituted by a di(C<sub>1</sub>-C<sub>6</sub>alkyl)phosphonate group is typically (CH<sub>3</sub>CH<sub>2</sub>O)<sub>2</sub>POCH<sub>2</sub>CO-, (CH<sub>3</sub>O)<sub>2</sub>POCH<sub>2</sub>CO-, (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O)<sub>2</sub>POCH<sub>2</sub>CO-, (CH<sub>3</sub>CH<sub>2</sub>O)<sub>2</sub>POCH<sub>2</sub>CH<sub>2</sub>CO-, (CH<sub>3</sub>O)<sub>2</sub>POCH<sub>2</sub>CH<sub>2</sub>CO-, (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O)<sub>2</sub>POCH<sub>2</sub>CH<sub>2</sub>CO-, (CH<sub>3</sub>CH<sub>2</sub>O)<sub>2</sub>PO(CH<sub>2</sub>)<sub>4</sub>CO-, (CH<sub>3</sub>CH<sub>2</sub>O)<sub>2</sub>PO(CH<sub>2</sub>)<sub>8</sub>CO- or (CH<sub>3</sub>CH<sub>2</sub>O)<sub>2</sub>PO(CH<sub>2</sub>)<sub>17</sub>CO-. C<sub>3</sub>-C<sub>25</sub>Alkanoyl which is interrupted

by oxygen, sulfur or  $\text{>N-R}_{14}$  is typically CH<sub>3</sub>-O-CH<sub>2</sub>CO-, CH<sub>3</sub>-S-CH<sub>2</sub>CO-,

CH<sub>3</sub>-NH-CH<sub>2</sub>CO-, CH<sub>3</sub>-N(CH<sub>3</sub>)-CH<sub>2</sub>CO-, CH<sub>3</sub>-O-CH<sub>2</sub>CH<sub>2</sub>-O-CH<sub>2</sub>CO-,  
CH<sub>3</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>-O-CH<sub>2</sub>CO-, CH<sub>3</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>3</sub>-O-CH<sub>2</sub>CO- or CH<sub>3</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>4</sub>-O-CH<sub>2</sub>CO-.

Alkanoyloxy is oxygen-capped alkanoyl; preferences are mainly as can be derived from alkanoyl above.

Alkenoyl of 3 to 25 carbon atoms is a branched or unbranched radical, typically propenoyl, 2-butenoyl, 3-butenoyl, isobutenoyl, n-2,4-pentadienoyl, 3-methyl-2-butenoyl, n-2-octenoyl, n-

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2-dodecenoyl, isododecenoyl, oleoyl, n-2-octadecenoyl or n-4-octadecenoyl. Alkenoyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, most preferably of 3 to 4, carbon atoms is preferred.

C<sub>3</sub>-C<sub>25</sub>Alkenoyl which is interrupted by oxygen, sulfur or  $\text{N}-\text{R}_{14}$  is typically

CH<sub>3</sub>OCH<sub>2</sub>CH<sub>2</sub>CH=CHCO- or CH<sub>3</sub>OCH<sub>2</sub>CH<sub>2</sub>OCH=CHCO-.

Alkenoyloxy is oxygen-capped alkenoyl; preferences are mainly as can be derived from alkenoyl above.

C<sub>6</sub>-C<sub>9</sub>Cycloalkylcarbonyl is typically cyclohexylcarbonyl, cycloheptylcarbonyl or cyclooctylcarbonyl. Cyclohexylcarbonyl is preferred. C<sub>6</sub>-C<sub>9</sub>Cycloalkylcarbonyloxy is oxygen-capped cycloalkylcarbonyl; preferences are analogous.

C<sub>1</sub>-C<sub>12</sub>Alkyl-substituted benzoyl which preferably carries 1 to 3, more preferably 1 or 2, alkyl groups is typically o-, m- or p-methylbenzoyl, 2,3-dimethylbenzoyl, 2,4-dimethylbenzoyl, 2,5-dimethylbenzoyl, 2,6-dimethylbenzoyl, 3,4-dimethylbenzoyl, 3,5-dimethylbenzoyl, 2-methyl-6-ethylbenzoyl, 4-tert-butylbenzoyl, 2-ethylbenzoyl, 2,4,6-trimethylbenzoyl, 2,6-dimethyl-4-tert-butylbenzoyl or 3,5-di-tert-butylbenzoyl. Preferred substituents are C<sub>1</sub>-C<sub>8</sub>alkyl, in particular C<sub>1</sub>-C<sub>4</sub>alkyl.

C<sub>1</sub>-C<sub>12</sub>Alkyl-substituted benzoyloxy which preferably carries 1 to 3, more preferably 1 or 2, alkyl groups is typically o-, m- or p-methylbenzoyloxy, 2,3-dimethylbenzoyloxy, 2,4-dimethylbenzoyloxy, 2,5-dimethylbenzoyloxy, 2,6-dimethylbenzoyloxy, 3,4-dimethylbenzoyloxy, 3,5-dimethylbenzoyloxy, 2-methyl-6-ethylbenzoyloxy, 4-tert-butylbenzoyloxy, 2-ethylbenzoyloxy, 2,4,6-trimethylbenzoyloxy, 2,6-dimethyl-4-tert-butylbenzoyloxy or 3,5-di-tert-butylbenzoyloxy. Preferred substituents are C<sub>1</sub>-C<sub>8</sub>alkyl, in particular C<sub>1</sub>-C<sub>4</sub>alkyl.

Alkyl of up to 25 carbon atoms is a branched or unbranched radical, such as methyl, ethyl, propyl, isopropyl, n-butyl, sec-butyl, isobutyl, tert-butyl, 2-ethylbutyl, n-pentyl, isopentyl, 1-methylpentyl, 1,3-dimethylbutyl, n-hexyl, 1-methylhexyl, n-heptyl, isoheptyl, 1,1,3,3-tetramethylbutyl, 1-methylheptyl, 3-methylheptyl, n-octyl, 2-ethylhexyl, 1,1,3-trimethylhexyl, 1,1,3,3-tetramethylpentyl, nonyl, decyl, undecyl, 1-methylundecyl, dodecyl, 1,1,3,3,5,5-hexamethylhexyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, eicosyl or docosyl. One of the preferred meanings of R<sub>2</sub> and R<sub>4</sub> is, for example, C<sub>1</sub>-C<sub>18</sub>alkyl. A particularly

preferred meaning of  $R_4$  is  $C_1$ - $C_4$ alkyl. One of  $R_2$  and  $R_4$  is preferably a branched radical; especially preferred are both  $R_2$  and  $R_4$  branched radicals.

Alkenyl of 3 to 25 carbon atoms is a branched or unbranched radical, such as propenyl, 2-butenyl, 3-butenyl, isobutenyl, n-2,4-pentadienyl, 3-methyl-2-butenyl, n-2-octenyl, n-2-dodecenyl, isododecenyl, oleyl, n-2-octadecenyl or n-4-octadecenyl. Alkenyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, in particular of 3 to 4, carbon atoms is preferred.

Alkenyloxy is oxygen capped alkenyl; preferences are analogous.

Alkynyl of 3 to 25 carbon atoms is a branched or unbranched radical, such as propynyl ( $-\text{CH}_2-\text{C}\equiv\text{CH}$ ), 2-butylnyl, 3-butylnyl, n-2-octynyl, or n-2-dodecynyl. Alkynyl of 3 to 18, preferably of 3 to 12, e.g. of 3 to 6, in particular of 3 to 4 carbon atoms is preferred. Preferences for alkynyloxy (oxygen capped alkynyl) are analogous.

$C_2$ - $C_{25}$ Alkyl which is interrupted by oxygen, sulfur or  $\text{N}-R_{14}$  is typically

$\text{CH}_3\text{-O-CH}_2\text{-}$ ,  $\text{CH}_3\text{-S-CH}_2\text{-}$ ,  $\text{CH}_3\text{-NH-CH}_2\text{-}$ ,  $\text{CH}_3\text{-N(CH}_3\text{)-CH}_2\text{-}$ ,  $\text{CH}_3\text{-O-CH}_2\text{CH}_2\text{-O-CH}_2\text{-}$ ,  $\text{CH}_3\text{-(O-CH}_2\text{CH}_2\text{)}_2\text{-O-CH}_2\text{-}$ ,  $\text{CH}_3\text{-(O-CH}_2\text{CH}_2\text{)}_3\text{-O-CH}_2\text{-}$  or  $\text{CH}_3\text{-(O-CH}_2\text{CH}_2\text{)}_4\text{-O-CH}_2\text{-}$ .

$C_7$ - $C_9$ Phenylalkyl is typically benzyl,  $\alpha$ -methylbenzyl,  $\alpha,\alpha$ -dimethylbenzyl or 2-phenylethyl. Benzyl and  $\alpha,\alpha$ -dimethylbenzyl are preferred.

$C_7$ - $C_9$ Phenylalkyl which is unsubstituted or substituted at the phenyl moiety by 1 to 3  $C_1$ - $C_4$ alkyl is typically benzyl,  $\alpha$ -methylbenzyl,  $\alpha,\alpha$ -dimethylbenzyl, 2-phenylethyl, 2-methylbenzyl, 3-methylbenzyl, 4-methylbenzyl, 2,4-dimethylbenzyl, 2,6-dimethylbenzyl or 4-tert-butylbenzyl. Benzyl is preferred.

$C_7$ - $C_{25}$ Phenylalkyl which is interrupted by oxygen, sulfur or  $\text{N}-R_{14}$  and which is unsubstituted or substituted at the phenyl moiety by 1 to 3  $C_1$ - $C_4$ alkyl is a branched or unbranched radical, such as phenoxymethyl, 2-methylphenoxymethyl, 3-methylphenoxymethyl, 4-m -

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thylphenoxymethyl, 2,4-dimethylphenoxymethyl, 2,3-dimethylphenoxymethyl, phenylthiomethyl, N-methyl-N-phenyl-methyl, N-ethyl-N-phenylmethyl, 4-tert-butylphenoxymethyl, 4-tert-butylphenoxyethoxymethyl, 2,4-di-tert-butylphenoxymethyl, 2,4-di-tert-butylphenoxyethoxymethyl, phenoxyethoxyethoxyethoxymethyl, benzyloxymethyl, benzyloxyethoxymethyl, N-benzyl-N-ethylmethyl or N-benzyl-N-isopropylmethyl.

C<sub>7</sub>-C<sub>9</sub>Phenylalkoxy is typically benzyloxy,  $\alpha$ -methylbenzyloxy,  $\alpha,\alpha$ -dimethylbenzyloxy or 2-phenylethoxy. Benzyloxy is preferred.

C<sub>1</sub>-C<sub>4</sub>Alkyl-substituted phenyl which preferably contains 1 to 3, in particular 1 or 2, alkyl groups is typically o-, m- or p-methylphenyl, 2,3-dimethylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 2,6-dimethylphenyl, 3,4-dimethylphenyl, 3,5-dimethylphenyl, 2-methyl-6-ethylphenyl, 4-tert-butylphenyl, 2-ethylphenyl or 2,6-diethylphenyl.

C<sub>1</sub>-C<sub>4</sub>Alkyl-substituted phenoxy which preferably contains 1 to 3, in particular 1 or 2, alkyl groups is typically o-, m- or p-methylphenoxy, 2,3-dimethylphenoxy, 2,4-dimethylphenoxy, 2,5-dimethylphenoxy, 2,6-dimethylphenoxy, 3,4-dimethylphenoxy, 3,5-dimethylphenoxy, 2-methyl-6-ethylphenoxy, 4-tert-butylphenoxy, 2-ethylphenoxy or 2,6-diethylphenoxy.

Unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl-substituted C<sub>5</sub>-C<sub>8</sub>cycloalkyl is, for example, cyclopentyl, methylcyclopentyl, dimethylcyclopentyl, cyclohexyl, methylcyclohexyl, dimethylcyclohexyl, trimethylcyclohexyl, tert-butylcyclohexyl, cycloheptyl or cyclooctyl. Cyclohexyl and tert-butylcyclohexyl are preferred.

Unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl-substituted C<sub>5</sub>-C<sub>8</sub>cycloalkoxy is, for example, cyclopentoxy, methylcyclopentoxy, dimethylcyclopentoxy, cyclohexoxy, methylcyclohexoxy, dimethylcyclohexoxy, trimethylcyclohexoxy, tert-butylcyclohexoxy, cycloheptoxy or cyclooctoxy. Cyclohexoxy and tert-butylcyclohexoxy are preferred.

Alkoxy of up to 25 carbon atoms is a branched or unbranched radical, such as methoxy, ethoxy, propoxy, isopropoxy, n-butoxy, isobutoxy, pentoxy, isopentoxy, hexoxy, heptoxy, octoxy, decyloxy, tetradecyloxy, hexadecyloxy or octadecyloxy. Alkoxy of 1 to 12, in particular of 1 to 8, e.g. of 1 to 6, carbon atoms is preferred.

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C<sub>2</sub>-C<sub>25</sub>Alkoxy which is interrupted by oxygen, sulfur or  $\text{>N-R}_{14}$  is typically

CH<sub>3</sub>-O-CH<sub>2</sub>CH<sub>2</sub>O-, CH<sub>3</sub>-S-CH<sub>2</sub>CH<sub>2</sub>O-, CH<sub>3</sub>-NH-CH<sub>2</sub>CH<sub>2</sub>O-, CH<sub>3</sub>-N(CH<sub>3</sub>)-CH<sub>2</sub>CH<sub>2</sub>O-,  
 CH<sub>3</sub>-O-CH<sub>2</sub>CH<sub>2</sub>-O-CH<sub>2</sub>CH<sub>2</sub>O-, CH<sub>3</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>O-CH<sub>2</sub>CH<sub>2</sub>O-,  
 CH<sub>3</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>3</sub>O-CH<sub>2</sub>CH<sub>2</sub>O- or CH<sub>3</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>4</sub>O-CH<sub>2</sub>CH<sub>2</sub>O-.

Alkylthio of up to 25 carbon atoms is a branched or unbranched radical, such as methylthio, ethylthio, propylthio, isopropylthio, n-butylthio, isobutylthio, pentylthio, isopentylthio, hexylthio, heptylthio, octylthio, decylthio, tetradecylthio, hexadecylthio or octadecylthio. Alkylthio of 1 to 12, in particular of 1 to 8, e.g. of 1 to 6 carbon atoms is preferred.

Alkylamino of up to 4 carbon atoms is a branched or unbranched radical, such as methylamino, ethylamino, propylamino, isopropylamino, n-butylamino, isobutylamino or tert-butylamino.

Di(C<sub>1</sub>-C<sub>4</sub>alkyl)amino also means that the two radicals are independently of the other branched or unbranched, such as dimethylamino, methylethylamino, diethylamino, methyl-n-propylamino, methylisopropylamino, methyl-n-butylamino, methylisobutylamino, ethylisopropylamino, ethyl-n-butylamino, ethylisobutylamino, ethyl-tert-butylamino, diethylamino, diisopropylamino, isopropyl-n-butylamino, isopropylisobutylamino, di-n-butylamino or di-isobutylamino.

Alkanoylamino of up to 25 carbon atoms is a branched or unbranched radical, such as formylamino, acetylamino, propionylamino, butanoylamino, pentanoylamino, hexanoylamino, heptanoylamino, octanoylamino, nonanoylamino, decanoylamino, undecanoylamino, dodecanoylamino, tridecanoylamino, tetradecanoylamino, pentadecanoylamino, hexadecanoylamino, heptadecanoylamino, octadecanoylamino, eicosanoylamino or docosanoylamino. Alkanoylamino of 2 to 18, in particular of 2 to 12, e.g. of 2 to 6, carbon atoms is preferred.

C<sub>1</sub>-C<sub>18</sub>Alkylene is a branched or unbranched radical, such as methylene, ethylene, propylene, trimethylene, tetramethylene, pentamethylene, hexamethylene, heptamethylene, octamethylene, decamethylene, dodecamethylene or octadecamethylene. C<sub>1</sub>-C<sub>12</sub>Alkylene and, in particular, C<sub>1</sub>-C<sub>8</sub>alkylene are preferred.



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A C<sub>1</sub>-C<sub>4</sub>Alkyl-substituted C<sub>5</sub>-C<sub>12</sub>cycloalkylene ring which preferably contains 1 to 3, in particular 1 or 2, branched or unbranched alkyl groups is typically cyclopentylene, methylcyclopentylene, dimethylcyclopentylene, cyclohexylene, methylcyclohexylene, dimethylcyclohexylene, trimethylcyclohexylene, tert-butylcyclohexylene, cycloheptylene, cyclooctylene or cyclodecylene. Cyclohexylene and tert-butylcyclohexylene are preferred.

C<sub>2</sub>-C<sub>18</sub>Alkylene which is interrupted by oxygen, sulfur or  $\text{N}-\text{R}_{14}$  is, for example,

-CH<sub>2</sub>-O-CH<sub>2</sub>-, -CH<sub>2</sub>-S-CH<sub>2</sub>-, -CH<sub>2</sub>-NH-CH<sub>2</sub>-, -CH<sub>2</sub>-N(CH<sub>3</sub>)-CH<sub>2</sub>-, -CH<sub>2</sub>-O-CH<sub>2</sub>CH<sub>2</sub>-O-CH<sub>2</sub>-,  
 -CH<sub>2</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>O-CH<sub>2</sub>-, -CH<sub>2</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>3</sub>O-CH<sub>2</sub>-, -CH<sub>2</sub>-(O-CH<sub>2</sub>CH<sub>2</sub>)<sub>4</sub>O-CH<sub>2</sub>- or  
 -CH<sub>2</sub>CH<sub>2</sub>-S-CH<sub>2</sub>CH<sub>2</sub>-.

C<sub>2</sub>-C<sub>18</sub>Alkenylene is typically vinylene, methylvinylene, octenylethylene or dodecenylethylene. C<sub>2</sub>-C<sub>8</sub>Alkenylene is preferred.

Alkylidene of 2 to 20 carbon atoms is, for example, ethylidene, propylidene, butylidene, pentylidene, 4-methylpentylidene, heptylidene, nonylidene, tridecylidene, nonadecylidene, 1-methylethylidene, 1-ethylpropylidene or 1-ethylpentylidene. C<sub>2</sub>-C<sub>8</sub>Alkylidene is preferred.

Phenylalkylidene of 7 to 20 carbon atoms is typically benzylidene, 2-phenylethylidene or 1-phenyl-2-hexylidene. C<sub>7</sub>-C<sub>9</sub>Phenylalkylidene is preferred.

C<sub>5</sub>-C<sub>8</sub>Cycloalkylene is a saturated hydrocarbon group having two free valencies and at least one ring unit and is typically cyclopentylene, cyclohexylene, cycloheptylene or cyclooctylene. Cyclohexylene is preferred.

C<sub>7</sub>-C<sub>8</sub>Bicycloalkylene is typically bicycloheptylene or bicyclooctylene.

Unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl-substituted phenylene or naphthylene is typically 1,2-, 1,3-, 1,4-phenylene, 1,2-, 1,3-, 1,4-, 1,6-, 1,7-, 2,6- or 2,7-naphthylene. 1,4-Phenylene is preferred.

A C<sub>1</sub>-C<sub>4</sub>alkyl-substituted C<sub>5</sub>-C<sub>8</sub>cycloalkylidene ring which preferably contains 1 to 3, in particular 1 or 2, branched or unbranched alkyl groups is typically cyclopentyliden, methylcyclo-

pentylidene, dimethylcyclopentylidene, cyclohexylidene, methylcyclohexylidene, dimethylcyclohexylidene, trimethylcyclohexylidene, tert-butylcyclohexylidene, cycloheptylidene or cyclooctylidene. Cyclohexylidene and tert-butylcyclohexylidene are preferred.

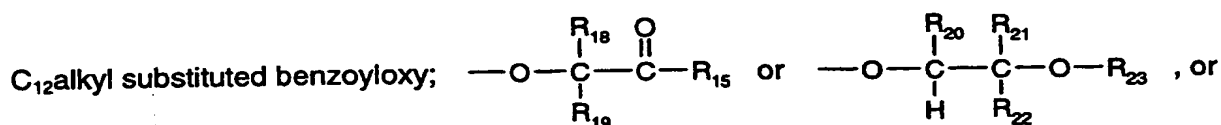
A mono-, di- or tri-valent metal cation is preferably an alkali metal cation, alkaline earth metal cation or aluminium cation, typically  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{++}$ ,  $\text{Ca}^{++}$  or  $\text{Al}^{+++}$ .

Preferred are compositions containing a compound of formula I, wherein  $\text{R}_2$ ,  $\text{R}_3$  and  $\text{R}_5$ , independently, are H, Cl, hydroxy,  $\text{C}_1\text{-C}_{25}$ alkyl,  $\text{C}_7\text{-C}_9$ phenylalkyl, unsubstituted or  $\text{C}_1\text{-C}_4$ alkyl-substituted phenyl;  $\text{C}_1\text{-C}_{18}$ alkoxy,  $\text{C}_1\text{-C}_{25}$ alkanoyloxy,  $\text{C}_3\text{-C}_{25}$ alkenoyloxy; and where

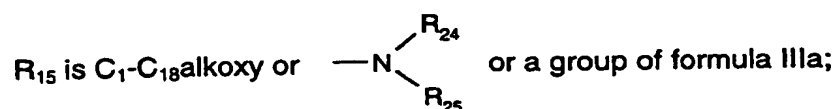
$\text{R}_4$  has a meaning as defined for  $\text{R}_2$  or is a group  $-\text{C}_m\text{H}_{2m}-\text{COR}_{15}$  or where  $\text{R}_3$ ,  $\text{R}_5$  and  $\text{R}_6$  are H,  $\text{R}_4$  may be a residue of formula III;

$\text{R}_6$  is H,

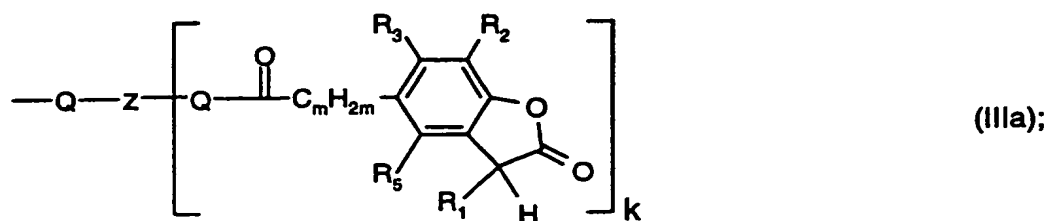
$\text{R}_7$ ,  $\text{R}_8$ ,  $\text{R}_9$ ,  $\text{R}_{10}$  and  $\text{R}_{11}$  independently are H, halogen, hydroxy,  $\text{C}_1\text{-C}_{25}$ alkyl, O interrupted  $\text{C}_2\text{-C}_{25}$ alkyl;  $\text{C}_1\text{-C}_{25}$ alkoxy, O interrupted  $\text{C}_2\text{-C}_{25}$ alkoxy,  $\text{C}_3\text{-C}_{25}$ alkenyl,  $\text{C}_3\text{-C}_{25}$ alkenylloxy,  $\text{C}_7\text{-C}_9$ phenylalkyl,  $\text{C}_7\text{-C}_9$ phenylalkoxy, unsubstituted or  $\text{C}_1\text{-C}_4$ alkyl-substituted phenyl; unsubstituted or  $\text{C}_1\text{-C}_4$ alkyl substituted phenoxy; unsubstituted or  $\text{C}_1\text{-C}_4$ alkyl substituted  $\text{C}_5\text{-C}_8$ cycloalkyl; unsubstituted or  $\text{C}_1\text{-C}_4$ alkyl substituted  $\text{C}_5\text{-C}_8$ cycloalkoxy;  $\text{C}_1\text{-C}_4$ alkylamino, di- $(\text{C}_1\text{-C}_4\text{-alkyl})$ amino,  $\text{C}_1\text{-C}_{25}$ alkanoyl;  $\text{C}_1\text{-C}_{25}$ alkanoyloxy;  $\text{C}_6\text{-C}_9$ cycloalkylcarbonyl,  $\text{C}_6\text{-C}_9$ cycloalkylcarbonyloxy, benzoyl or  $\text{C}_1\text{-C}_{12}$ alkyl-substituted benzoyl; benzoyloxy or  $\text{C}_1\text{-C}_{12}$ alkyl substituted benzoyloxy;



where in formula II  $\text{R}_7$  and  $\text{R}_8$  or  $\text{R}_8$  and  $\text{R}_{11}$  together with the carbon atoms, they are bonded to, form a phenyl ring;



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$R_{16}$  and  $R_{17}$  independently are H,  $CF_3$ ,  $C_1$ - $C_{12}$ alkyl or phenyl; or  $R_{16}$  and  $R_{17}$  together with the bonding carbon atom form an unsubstituted or 1-3  $C_1$ - $C_4$ alkyl-substituted  $C_5$ -

$C_8$ cycloalkylidene ring;

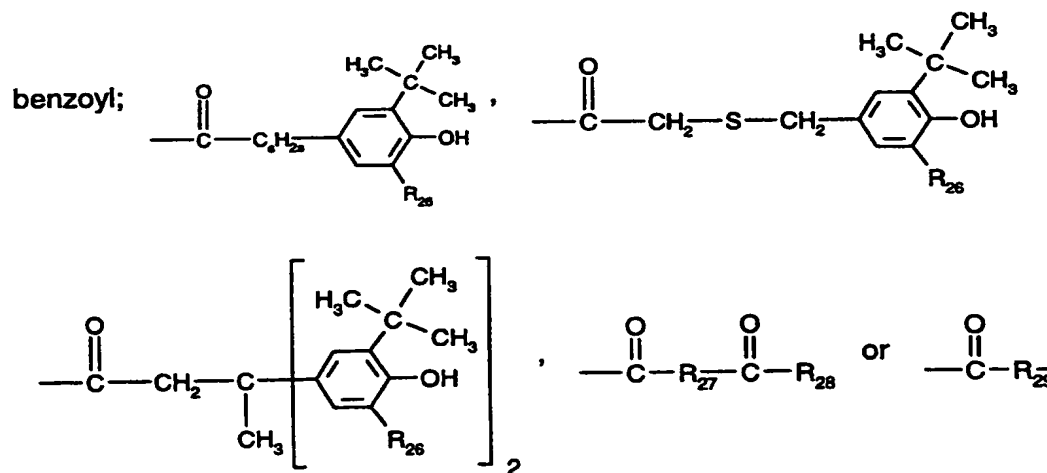
$R_{18}$  and  $R_{19}$  independently are H,  $C_1$ - $C_4$ alkyl or phenyl;

$R_{20}$  is H or  $C_1$ - $C_4$ alkyl;

$R_{21}$  is H, unsubstituted or  $C_1$ - $C_4$ alkyl substituted phenyl;  $C_1$ - $C_{25}$ alkyl, unsubstituted or on the phenyl ring 1-3  $C_1$ - $C_4$ alkyl-substituted  $C_7$ - $C_9$ phenylalkyl;

$R_{22}$  is H or  $C_1$ - $C_4$ alkyl;

$R_{23}$  is H,  $C_1$ - $C_{25}$ alkanoyl,  $C_3$ - $C_{25}$ alkenoyl; di( $C_1$ - $C_6$ alkyl)phosphonate-substituted  $C_2$ - $C_{25}$ alkanoyl;  $C_6$ - $C_9$ cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or  $C_1$ - $C_{12}$ alkyl-substituted



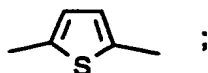
$R_{24}$  and  $R_{25}$  independently are H or  $C_1$ - $C_{18}$ alkyl;

$R_{26}$  is H or  $C_1$ - $C_8$ alkyl;

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$R_{27}$  is a direct bond,  $C_1$ - $C_{18}$ alkylen,  $C_2$ - $C_{18}$ alkenylen,  $C_7$ - $C_{20}$ phenylalkyliden,  $C_5$ -

$C_8$ cycloalkylen, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenylene,  or



$R_{28}$   $C_1$ - $C_{18}$ alkoxy or  ;

$R_{29}$  is O or -NH-;

$R_{30}$   $C_1$ - $C_{18}$ alkyl or phenyl;

M a metal cation of the valency r;

X a direct bond, O, S or -NR<sub>31</sub>-;

n 1 or 2;

m is a number from the range 1-8;

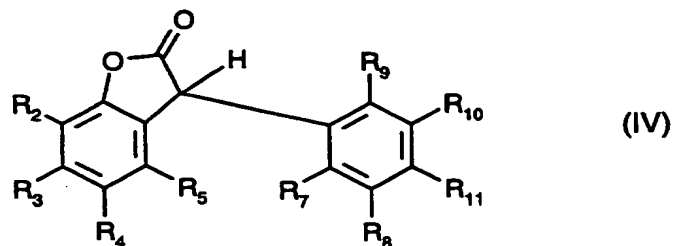
q 1, 2, 3, 4, 5 or 6;

r 1, 2 or 3; and

s is 0, 1 or 2.

$R_4$  is preferably not H, most preferably not H and not OH.

Most preferred for use according to present invention is a compound of the formula IV



wher in

$R_2$  is H or  $C_1$ - $C_{20}$ alkyl;

$R_3$  is H or  $C_1$ - $C_{18}$ alkyl;

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$R_4$  is  $C_1$ - $C_6$ alkyl or a group  $-C_mH_{2m}-COR_{15}$  or a group of the formula III;

$R_5$  is H or  $C_1$ - $C_{18}$ alkyl;

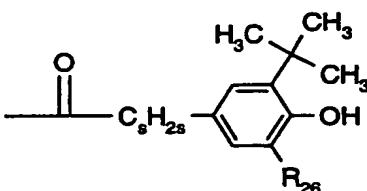
$R_7, R_8, R_9, R_{10}$  and  $R_{11}$  independently are H, OH, chloro,  $C_1$ - $C_{18}$ alkyl,  $C_1$ - $C_{18}$ alkoxy, di( $C_1$ -

$C_4$ alkyl)amino, phenyl,  $C_2$ - $C_{18}$ alkanoyloxy or 
$$-O-\overset{\overset{R_{20}}{|}}{\underset{\underset{H}{|}}{C}}-\overset{\overset{R_{21}}{|}}{\underset{\underset{R_{22}}{|}}{C}}-O-R_{23}$$
;

especially wherein at least 2 of the residues  $R_7, R_8, R_9, R_{10}, R_{11}$  are H;

$R_{15}$  is  $C_1$ - $C_{18}$ alkoxy or a group of the formula IIIa;

$R_{20}, R_{21}$  and  $R_{22}$  are H;

$R_{23}$  is H,  $C_2$ - $C_{18}$ alkanoyl or a group 

$R_{26}$  is  $C_1$ - $C_4$ alkyl and

Q is oxygen;

Z is  $C_2$ - $C_{12}$ alkylene;

k is 2;

m is 1, 2, 3, 4, 5 or 6 and

s is 0, 1 or 2.

Interesting compositions are those containing as component (b) at least one compound of formula I, wherein, if  $n = 1$ ,  $R_1$  is phenyl which is unsubstituted or substituted in para-position by  $C_1$ - $C_{18}$ alkylthio or di( $C_1$ - $C_4$ -alkyl)amino; mono- to penta-substituted alkylphenyl containing together a total of at most 18 carbon atoms in the 1 to 5 alkyl substituents; naphthyl, biphenyl, terphenyl, phenanthryl, anthryl, fluorenyl, carbazolyl, thienyl, pyrrolyl, phenothiazinyl or 5,6,7,8-tetrahydronaphthyl which are unsubstituted or substituted by  $C_1$ - $C_4$ -alkyl,  $C_1$ - $C_4$ alkoxy,  $C_1$ - $C_4$ alkylthio, hydroxy or amino.

Also preferred compositions contain compounds of the formula I wherein the bonding atom in  $R_2$  is a secondary or tertiary carbon atom, especially wherein  $R_2$  is secondary  $C_6$ - $C_{22}$  alkyl or tertiary  $C_4$ - $C_{22}$ alkyl or phenyl or substituted phenyl, and/or wherein at least one of  $R_2$  and  $R_4$  contains an ester group.

Especially preferred are compounds of the formula IV wherein

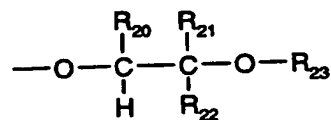
$R_2$  is H or  $C_1$ - $C_{20}$ alkyl;

$R_3$  is H or  $C_1$ - $C_{18}$ alkyl;

$R_4$  is H, hydroxy,  $C_1$ - $C_6$ alkyl,  $-(CH_2)_p-COR_{15}$  or  $-C(CH_3)_2-(CH_2)_p-COR_{15}$ ;

$R_5$  is H or  $C_1$ - $C_{18}$ alkyl;

$R_7$ ,  $R_8$ ,  $R_9$ ,  $R_{10}$  and  $R_{11}$  independently are H,  $C_1$ - $C_{18}$ alkyl,  $C_1$ - $C_{18}$ alkoxy or



especially wherein at least 2 of the residues  $R_7$ ,  $R_8$ ,  $R_9$ ,  $R_{10}$ ,  $R_{11}$  are H;

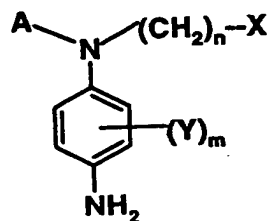
$R_{15}$  is  $C_1$ - $C_{18}$ alkoxy;

$R_{20}$ ,  $R_{21}$  and  $R_{22}$  are H; and

$p$  is 2 or 3.

Compounds of the formula I or IV can be obtained according to methods known in the art, e.g. as described in GB-A-2281910 or publications cited therein, or, like compounds of formula V, in analogy to those methods. Some compounds of the formula I are commercially available.

This class of lactones are preferably used to trap the oxidised form of a developer having the following general structure:



where  $A = C_1$ - $C_6$ -Alkyl;

$n = 1 - 6$ ;

$X = \text{Hydrogen, Hydroxy, } C_1$ - $C_8$ -Alkoxy,  $COR_{15}$ ,  $NHSO_2R_{30}$ ;

$Y = C_1$ - $C_8$ alkyl,  $C_1$ - $C_8$ alkoxy, halogen;  $m = 0 - 4$ .

In the above structure the preferred substituents are  $A = -CH_2CH_3$  and  $n=2$ ,  
 $X = NHSO_2CH_3$ ,  $Y = -CH_3$  and  $m = 1$ .

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In general, the photographic material consists of at least five layers, of which three are light sensitive layers containing cyan, magenta and yellow couplers and silver halide emulsion and two are non light sensitive layers, one in between the blue and green sensitive layers and the other in between the green and red sensitive layers.

The compound of the formula I is preferably contained in one or more non light sensitive layers; the light sensitive layers preferably contain a lower concentration of the compound of the formula I, especially none.

In general, the compounds of the formula I are contained in the photographic material in an amount from 10 to 1000 mg/m<sup>2</sup>, especially from 30 to 500 mg/m<sup>2</sup>.

The lactones of formula I can be milled with polymers (e.g. PVS, polyester, polyvinyl alcohol etc.) and placed in the interlayer thus preventing its migration to the adjacent photographic (light sensitive) layers. Also, the benzofuranones containing a suitable functional group (e.g. ester, hydroxy) can be reacted with a polymer, e.g. a polyvinyl alcohol or polyester, in order to attach them chemically. This form will reduce their migrating tendency.

The novel colour photographic recording material is preferably a material having the following layer sequence:

a	a: Protective layer
b	b: Interlayer (may be absent)
c	c: Red-sensitive layer
d	d: Interlayer
e	e: Green-sensitive layer
f	f: Interlayer
g	g: Blue-sensitive layer
h	h: Base

Another example is a material having a similar layer structure but in which layer a is absent.

Essential constituents of the colour-photographic emulsion layers are binders, silver halide particles and colour couplers.

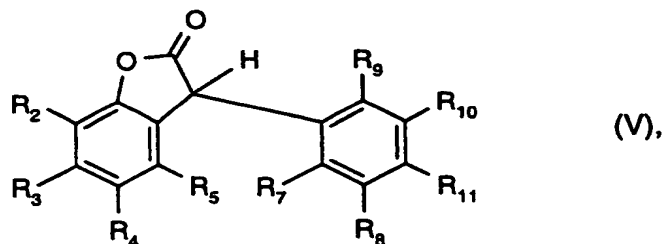
- 20 -

Of especial interest, for example, is a colour photographic recording material comprising, on a base, at least one blue-sensitive silver halide emulsion layer containing at least one yellow coupler, at least one green-sensitive silver halide emulsion layer containing at least one magenta coupler, at least one red-sensitive silver halide emulsion layer containing at least one cyan coupler, and customary top layer(s) and interlayers separating the light-sensitive layers, at least one of the interlayers comprising a compound of the formula (I).

The compounds of this invention are typically incorporated in the photographic material with the aid of a suitable solvent such as a coupler solvent.

Further details on the structure of the colour photographic material of the invention, and the components which can be employed in the novel material, can be found, inter alia, in US-A-5,538,840, column 27, line 25, to column 106, line 16, and in US-A-5,780,625, column 12, line 6, until column 57, line 6, and the publications cited in these 2 references; these passages of US-A-5,538,840 and US-A-5,780,625 are hereby incorporated by reference. Other useful information, how compounds of the formula I can be used in photographic material, can be taken from DE-A-19749083, page 16, line 35, until page 17, line 45, especially the references cited therein. Further important components, especially couplers, are described in US-5,578,437; GB-A-2319523 describes from page 49, line 21, until page 73, line 2, further details of the colour photographic material, especially couplers (page 52, line 1, until page 56, line 22), UV absorbers (page 56, line 25, until page 68, line 1) and dark stabilisers (page 68, line 2, until page 73, line 2).

Some of the compounds of the formula I are new compounds. Thus, this invention also pertains to a compound of the formula V



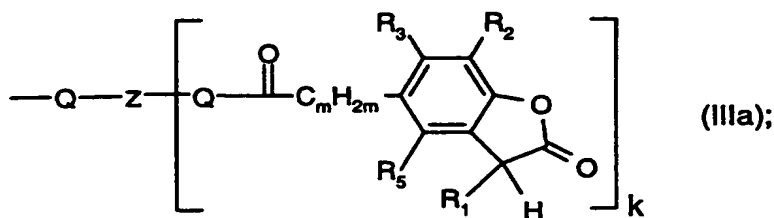
wherein



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$R_4$  is  $-(CH_2)_s-COR'_{15}$  or  $-C_pH_{2p}-COR_{15}$  or  $-C_tH_{2t}-COR_{15}$ , wherein the alkylene moiety  $C_pH_{2p}$  is branched alkylene and the alkylene moiety  $C_tH_{2t}$  is a straight chain or branched alkylene moiety;

$R_{15}$  is hydroxy,  $\left[-O^- \frac{1}{r} M^{r+}\right]$ ,  $C_1-C_{20}$ alkoxy,  $-N \begin{smallmatrix} R_{24} \\ R_{25} \end{smallmatrix}$ , or a group of the formula IIIa



Q is oxygen or  $-NH-$ ,

Z is a linking group of valency  $(k+1)$  and is as a divalent group  $C_2-C_{12}$ alkylene, Q-interrupted  $C_4-C_{12}$ alkylene, phenylene or phenylene-D-phenylene with D being  $C_1-C_4$ alkylene, O, S, SO or  $SO_2$ ;

Z as a trivalent group is  $C_3-C_{12}$ alkanetriyl, a trivalent residue of a hexose or a hexitol, a group  $(-CH_2)_3C-CH_2OH$ , or a group  $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}-$ ; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol,  $C_4-C_{12}$ alkanetetryl,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12, preferably 1-6,

p is 1 or 2;

s is 0, 1 or 2;

t is a number from the range 3-12, preferably 3-6;

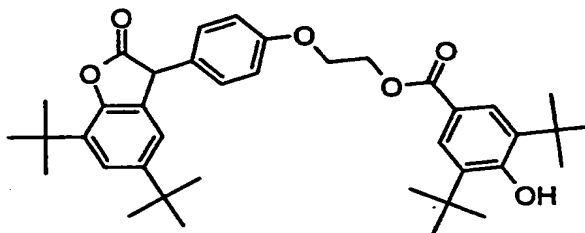
and all other residues are as defined for formula I if n is 1.

Preferred compounds of the formula V are, within the limits given, as defined for formulae I or IV above.

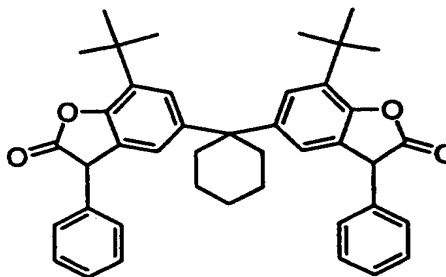
Compounds of the formula V are also useful as stabilisers for organic material against degradation by light, oxygen and/or heat. Application of these compounds and methods of stabilising are generally as described in GB-A-2322861; examples for organic material which can be stabilized are listed, for example, in GB-A-2319523 from page 15, line 11, until page 20, line 25; possible costabilizers are as listed, for example, in GB-A-2319523 from page 21, line 16, until page 32, bottom line. Compounds of the formula V are used for this application preferably in an amount of 0.0005 to 5%, based on the weight of the organic material to be stabilised.

Examples for compounds of the formula I to be used within this invention are

Compound 1:

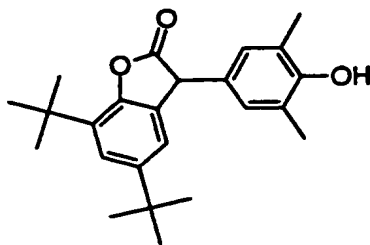


Compound 2:

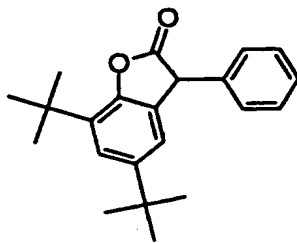


-- 23 --

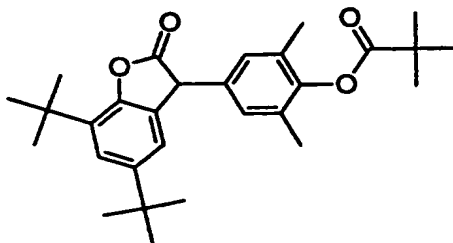
Compound 4:



Compound 5:

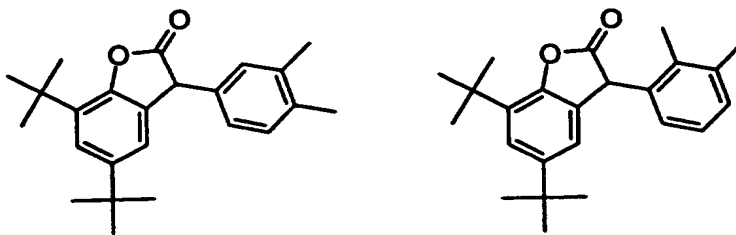


Compound 6:

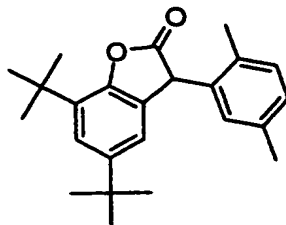


Compound 7:

A mixture of the two isomers

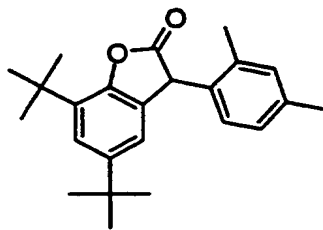


Compound 8:

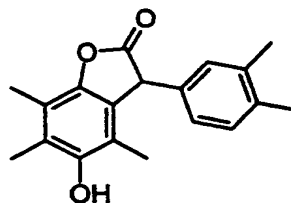


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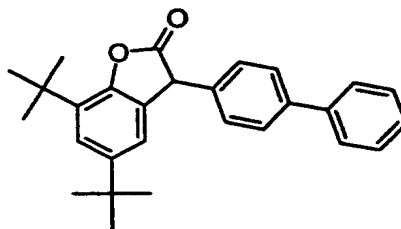
Compound 9:



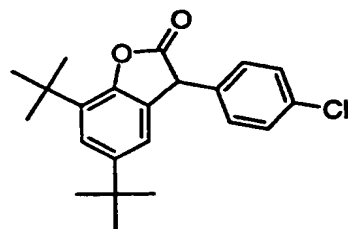
Compound 10:



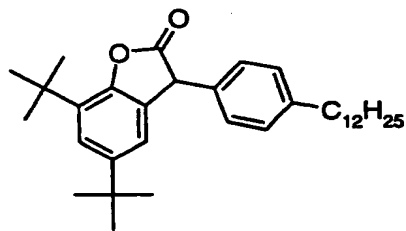
Compound 11:



Compound 12:

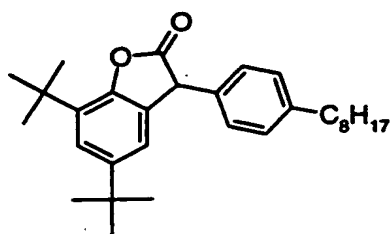


Compound 13:

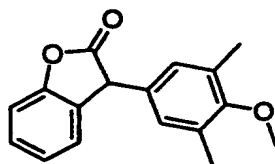


- 25 -

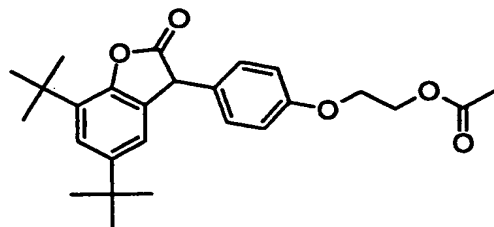
Compound 14:



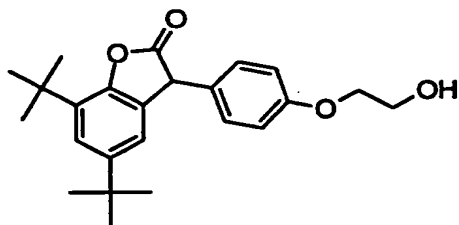
Compound 15:



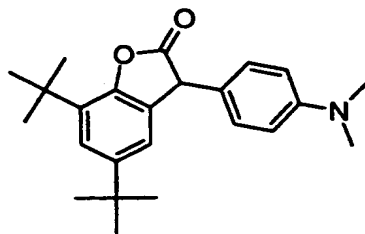
Compound 16:



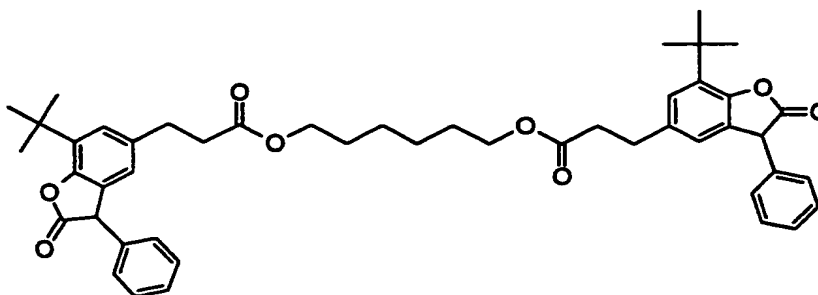
Compound 17:



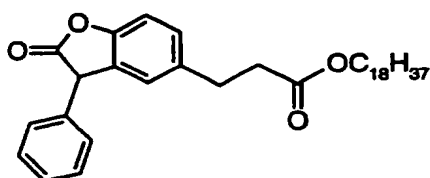
Compound 18:



**Compound 19:**

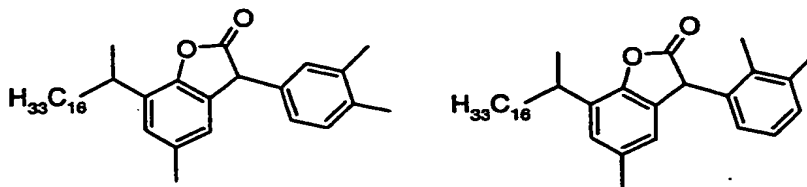


**Compound 20:**

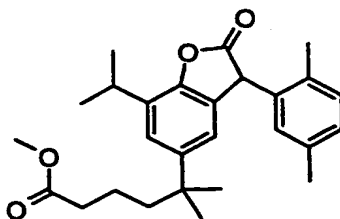


**Compound 21:**

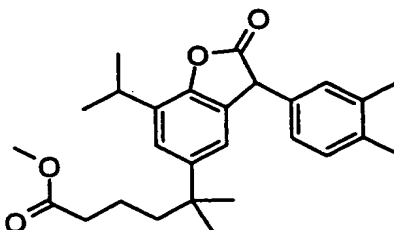
### A mixture of the two isomers



**Compound 22:**

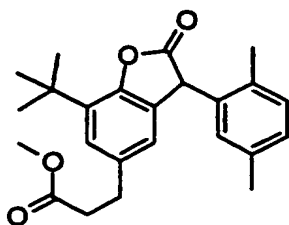


**Compound 23:**



- 27 -

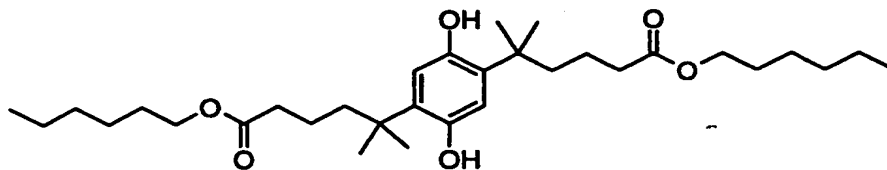
Compound 24:



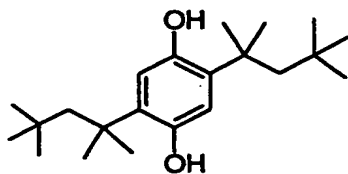
The synthetic methods used for the preparation of the lactones shown above are described e.g. in US Patent 5516 920.

These lactones can also be used in combination with hydroquinones of e.g. formula A-1 and/or A-2, 6-hydroxychromans such as of formula A-3, or hydroxylamines of e.g. formula A-4:

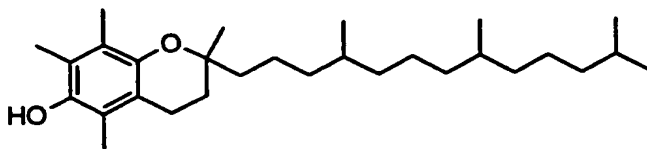
A-1



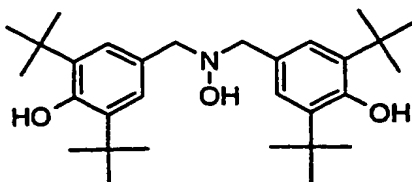
A-2



A-3



A-4



**Example 1**

To evaluate compounds of this invention with respect to their ability as interlayer scavengers for oxidised developing agent, three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

**Test element 1 (reference sample)****(1) A receiver layer containing :**

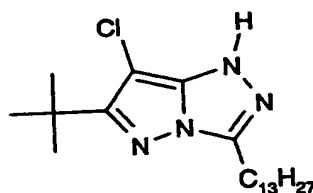
- 1800 mg.m<sup>-2</sup> of gelatin
- 180 mg.m<sup>-2</sup> of dibutylphthalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

**(2) An interlayer containing :**

- 1800 mg.m<sup>-2</sup> of gelatin
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

**(3) A photosensitive layer containing :**

- 260 mg.m<sup>-2</sup> (based on silver) of an unsensitized silver bromide emulsion
- 1800 mg.m<sup>-2</sup> of gelatin
- 300 mg.m<sup>-2</sup> of magenta-dye-forming coupler M-1
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, potassium salt hardener
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

**M-1****Test element 2 (check sample)****(1) A receiver layer containing :**

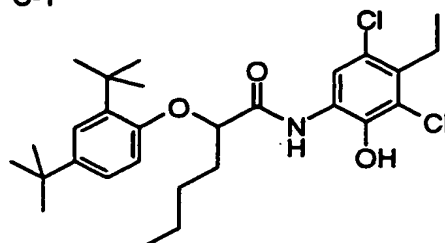
- 1800 mg.m<sup>-2</sup> of gelatin
- 272 mg.m<sup>-2</sup> of cyan-dye-forming coupler C-1
- 180 mg.m<sup>-2</sup> of dibutylphthalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

**(2) An interlayer having the same composition as the interlayer of test element 1****(3) A photosensitive layer having the same composition as the photosensitive layer of test element 1.**



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C-1

**Test elements 3-8**

- (1) A receiver layer having the same composition as the receiver layer of test element 2
- (2) An interlayer containing
  - 1800 mg.m<sup>-2</sup> of gelatin
  - 0.056x10<sup>-3</sup> mol.m<sup>-2</sup> of oxidised developer scavenger as indicated in table 1 below
  - 300 mg.m<sup>-2</sup> of tricresylphosphate
  - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- (3) A photosensitive layer having the same composition as the photosensitive layer of test element 1.

The test elements are imagewise exposed through a step wedge with density increment 0.15 and thereafter subjected to the AGFA P-94 developing process.

Within test elements 2-9, cyan dye can only be formed by the wandering of the oxidised developer from the layer in which it is formed (i.e. the uppermost layer) to the bottom layer containing the cyan-dye-forming coupler. The ability of an interlayer scavenger to prevent oxidised developer from diffusing into the bottom layer can thus be assessed by determining the red density at any chosen exposure amount.

The red density at the exposure amount giving a green density of 2 is reported in table 1. The red density in the test element containing no cyan coupler in the bottom layer (test element 1) arises exclusively from the side absorption of the magenta dye in the red part of the visible spectrum.

**Table 1**

Test element	Interlayer scavenger	Red density at a green density of 2
1 (reference)	none	0.268
2 (check)	none	0.400
3	Compound 1	0.320
4	Compound 2	0.278
5	Compound 3	0.349
6	Compound 4	0.313
7	Compound 5	0.327
8	Compound 6	0.319

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Any red density inferior to that observed in sample 2 indicates scavenging of the oxidised developer. It is thus clear from the data in table 1 that compounds within the scope of this invention are very effective in preventing the oxidised developer from wandering and forming dye in the wrong layer.

### Example 2

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

#### Test element 9 (reference sample)

Same as test element 1 of example 1

#### Test element 10 (check sample)

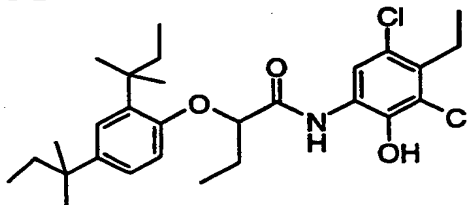
(1) A receiver layer containing :

- 1800 mg.m<sup>-2</sup> of gelatin
- 272 mg.m<sup>-2</sup> of cyan-dye-forming coupler C-2
- 180 mg.m<sup>-2</sup> of dibutylphthalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(2) An interlayer having the same composition as the interlayer of test element 9

(3) A photosensitive layer having the same composition as the photosensitive layer of test element 9.

C-2



#### Test elements 11-14

(1) A receiver layer having the same composition as the receiver layer of test element 10

(2) An interlayer containing

- 1800 mg.m<sup>-2</sup> of gelatin
- 30 mg.m<sup>-2</sup> of oxidised developer scavenger as indicated in table 2 below
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer having the same composition as the photosensitive layer of test element 9.

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The test elements were exposed and processed in the same manner as in example 1.

The red density at the exposure amount giving a green density of 2 is reported in table 2.

**Table 2**

Test element	Interlayer scavenger	Red density at a green density of 2
9 (reference)	none	0.264
10 (check)	none	0.372
11	Compound 7	0.284
12	Compound 8	0.308
13	Compound 9	0.300
14	Compound 24	0.302

According to the data in table 2, the compounds of this invention used in the test elements 11-14 are very effective oxidised developer scavengers.

### Example 3

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

#### Test element 15 (check sample)

(1) A receiver layer containing :

- 1800 mg.m<sup>-2</sup> of gelatin
- 272 mg.m<sup>-2</sup> of cyan-dye-forming coupler C-2
- 180 mg.m<sup>-2</sup> of dibutylphthalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(2) An interlayer containing :

- 1800 mg.m<sup>-2</sup> of gelatin
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer containing :

- 260 mg.m<sup>-2</sup> of an unsensitized silver bromide emulsion
- 1800 mg.m<sup>-2</sup> of gelatin
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, sodium salt hardener
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

#### Test elements 16-27

- (1) A receiver layer having the same composition as the receiver layer of test element 15

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- (2) An interlayer containing
- 1800 mg.m<sup>-2</sup> of gelatin
  - 30 mg.m<sup>-2</sup> of oxidised developer scavenger as indicated in table 3 below
  - 300 mg.m<sup>-2</sup> of tricresylphosphate
  - 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- (3) A photosensitive layer having the same composition as the photosensitive layer of test element 15.

The test elements are given a stepped exposure and processed as in example 1.

Cyan dye formation within the above described test elements will again only result from the wandering of the oxidised developer from the photosensitive layer to the layer containing the cyan-dye-forming coupler. The ability of an interlayer scavenger to prevent oxidised developer from diffusing into the bottom layer can thus be assessed by measuring the red density at any given exposure.

As the above described samples contain no dye-forming coupler in the photosensitive layer, there is almost no consumption of the oxidised developer within the latter and the flux of oxidised developer through the interlayer towards the layer containing the cyan coupler is thus markedly increased as compared to the samples of examples 1 and 2.

In table 3, (D<sub>red</sub>)<sub>1.35</sub> is the red density at the exposure amount obtained behind the 1.35 density step of the step wedge. With the test elements 1-14, this exposure amount gives a green density of about 1.9. The smaller the (D<sub>red</sub>)<sub>1.35</sub> value, the more effective the scavenging of the oxidised developer.

Table 3

Test element	Interlayer Scavenger	(D <sub>red</sub> ) <sub>1.35</sub>
15 (check)	none	0.405
16	Compound 7	0.282
17	Compound 10	0.250
18	Compound 11	0.309
19	Compound 12	0.292
20	Compound 13	0.318
21	Compound 14	0.324
22	Compound 15	0.335
23	Compound 16	0.300
24	Compound 18	0.314
25	Compound 19	0.335
26	Compound 20	0.344
27	Compound 21	0.314

- 33 -

From the data in table 3, it can be seen again that 3-aryl-3H-benzofuran-2-ones according to this invention exhibit outstanding scavenging ability, as evidenced by much smaller red density values in the test elements 16-27 as compared to the check sample.

#### Example 4

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

##### Test element 28 (reference sample)

(1) A receiver layer containing :

- 1800 mg.m<sup>-2</sup> of gelatin
- 180 mg.m<sup>-2</sup> of dibutylphthalate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(2) An interlayer containing :

- 1800 mg.m<sup>-2</sup> of gelatin
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer containing :

- 260 mg.m<sup>-2</sup> of an unsensitized silver bromide emulsion
- 1800 mg.m<sup>-2</sup> of gelatin
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, sodium salt hardener
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

##### Test element 29 (check sample)

Same as test element 15 of example 3 except that the cyan coupler used is C-1 instead of C-2.

##### Test elements 30-33

(1) A receiver layer having the same composition as the receiver layer of test element 29

(2) An interlayer containing

- 1800 mg.m<sup>-2</sup> of gelatin
- Oxidised developer scavenger as indicated in table 4 below
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

(3) A photosensitive layer having the same composition as the photosensitive layer of test element 29.

The test elements are given a stepped exposure and processed as in example 1.

In table 4,  $(D_{\text{red}})_{1.05}$  is the red density at the exposure amount obtained behind the 1.05 density step of the step wedge. With the test elements 1-14, this exposure amount gives a green density of about 2.4. The smaller the  $(D_{\text{red}})_{1.05}$  value, the more effective the scavenging of the oxidised developer.

**Table 4**

Test element	Interlayer Scavenger	Concentration	$(D_{\text{red}})_{1.05}$
28 (reference)	none	-	0.080
29 (check)	none	-	0.482
30	Compound 7	30 mg.m <sup>-2</sup>	0.390
31	Compound 7	60 mg.m <sup>-2</sup>	0.313
32	Compound 7	90 mg.m <sup>-2</sup>	0.202
33	Compound 7	120 mg.m <sup>-2</sup>	0.127

From the data in table 4, it can be seen that compound 7 according to this invention effectively prevents the formation of cyan dye, and that the Dox scavenging effect increases in proportion to the amount of added compound.

**Example 5**

Three layer photographic test elements are prepared by providing layers in the order indicated on a polyethylene-coated paper support :

**Test element 34 (check sample)****(1) A layer containing :**

- 1800 mg.m<sup>-2</sup> of gelatin
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent.

**(2) A photosensitive layer containing :**

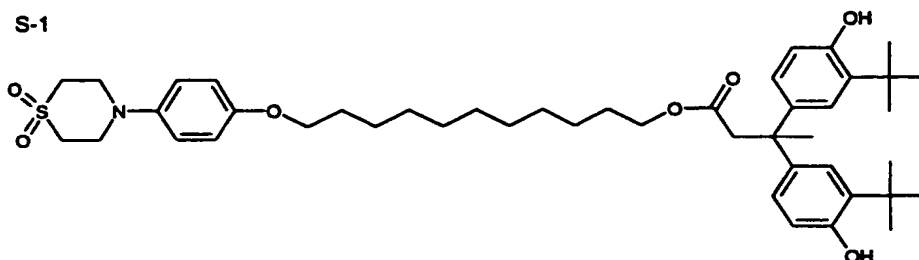
- 260 mg.m<sup>-2</sup> (based on silver) of an unsensitized silver bromide emulsion
- 1800 mg.m<sup>-2</sup> of gelatin
- 300 mg.m<sup>-2</sup> of magenta-dye-forming coupler M-1 (see example 1)
- 225 mg.m<sup>-2</sup> of the magenta dye light stabiliser S-1 (see below)
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 7-methyl-5-hydroxy-1,3,8-triazaindolizine antifoggant.

**(3) A layer containing :**

- 1800 mg.m<sup>-2</sup> of gelatin
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent

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- 2-hydroxy-4,6-dichloro-1,3,5-triazine, potassium salt hardener.



### Test elements 35-39

(1) A layer containing :

- 1800 mg.m<sup>-2</sup> of gelatin
- 80 mg.m<sup>-2</sup> of oxidised developer scavenger as indicated in table 5 below
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent.

(2) A photosensitive layer having the same composition as the photosensitive layer of test element 34 .

(3) A layer containing :

- 1800 mg.m<sup>-2</sup> of gelatin
- 80 mg.m<sup>-2</sup> of oxidised developer scavenger as indicated in table 5 below
- 300 mg.m<sup>-2</sup> of tricresylphosphate
- 2-sulfonate-4,8-diisobutyl-naphtalene, sodium salt surface active agent
- 2-hydroxy-4,6-dichloro-1,3,5-triazine, potassium salt hardener.

The test elements were imagewise exposed through a step wedge with density increment 0.30 and thereafter subjected to the AGFA P-94 developing process.

In order to evaluate them for light fastness, the stepped magenta images obtained in this manner are irradiated through an ultraviolet filter in an Atlas device equipped with a 3500 W Xenon lamp.

In a second experiment, magenta images obtained in the above described way are stored in the dark at 60°C, 95%RH for 72 hours prior to light exposure in the Atlas device.

In all cases the light fastness of the magenta image was evaluated based on the percentage of the residual dye density after 30 kJ/cm<sup>2</sup> of light exposure (initial density = 1). The results are given in table 5.

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**Table 5**

Test element	Interlayer Scavenger	Residual dye after 30 kJ.cm <sup>-2</sup> of Atlas exposure (%)	
		no dark storage (60°C, 95% RH) prior to irradiation in the Atlas	72 h dark storage (60°C, 95% RH) prior to irradiation in the Atlas
34 (check)	none	75	75
35 (comparison)	A-1	74	60
36 (comparison)	A-2	71	45
37	Compound 7	76	77
38	Compound 12	77	74
39	Compound 21	75	75

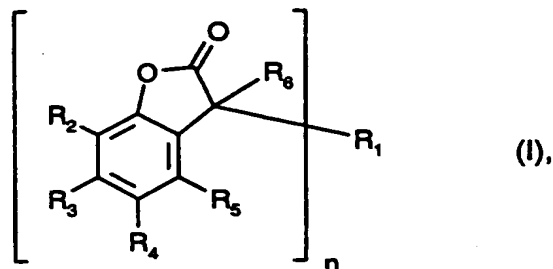
From the data in table 5, it can be seen that the oxidised developer scavengers according to this invention are not detrimental at all to the light resistance of the magenta layer, whether the samples are subjected to a preliminary dark storage period at 60°C, 95%RH or not. Conversely, the comparison hydroquinone scavengers A-1 and A-2 clearly impair the light fastness of the magenta image after the samples had been left under a high temperature and humidity for 72 hours.



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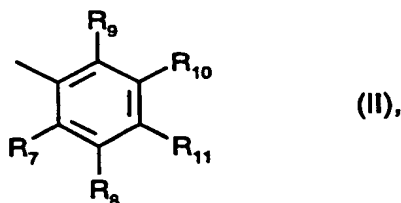
**Claims:**

1. Process for preventing migration of the oxidised developer in a colour photographic material from one colour sensitive layer to another by incorporating a compound of the formula I into said material



wherein, if  $n = 1$ ,

$R_1$  is naphthyl, phenanthryl, anthryl, 5,6,7,8-tetrahydro-2-naphthyl, 5,6,7,8-tetrahydro-1-naphthyl, thienyl, benzo[b]thienyl, naphtho[2,3-b]thienyl, thianthrenyl, dibenzofuryl, chromenyl, xanthenyl, phenoxathiinyl, pyrrolyl, imidazolyl, pyrazolyl, pyrazinyl, pyrimidinyl, pyridazinyl, indoliziny, isoindolyl, indolyl, indazolyl, purinyl, quinoliziny, isoquinolyl, quinolyl, phthalazinyl, naphthyridinyl, quinoxalinyl, quinazolinyl, cinnoliny, pteridinyl, carbazolyl,  $\beta$ -carbolinyl, phenanthridinyl, acridinyl, perimidinyl, phenanthrolinyl, phenazinyl, isothiazolyl, phenothiazinyl, isoxazolyl, furazanyl, biphenyl, terphenyl, fluorenyl or phenoxazinyl, each of which is unsubstituted or substituted by  $C_1$ - $C_4$ alkyl,  $C_1$ - $C_4$ alkoxy,  $C_1$ - $C_4$ alkylthio, hydroxy, halogen, amino,  $C_1$ - $C_4$ alkylamino, phenylamino or di( $C_1$ - $C_4$ -alkyl)amino, or  $R_1$  is a radical of formula II



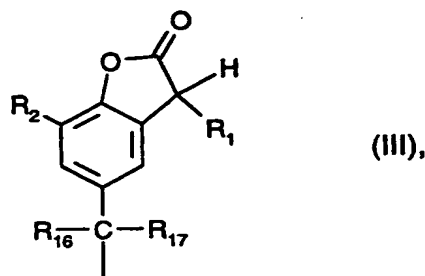
and, if  $n = 2$ ,

$R_1$  is unsubstituted or  $C_1$ - $C_4$ alkyl- or hydroxy-substituted phenylene or naphthylene; or  $-R_{12}-X-R_{13}-$ ,

$R_2$ ,  $R_3$ ,  $R_4$  and  $R_5$  are each independently of one another hydrogen, chloro, hydroxy,  $C_1$ - $C_{25}$ -alkyl,  $C_7$ - $C_9$ phenylalkyl, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenyl; unsubstituted or  $C_1$ - $C_4$ alkyl-substituted  $C_5$ - $C_8$ cycloalkyl;  $C_1$ - $C_{18}$ alkoxy,  $C_1$ - $C_{18}$ alkylthio,  $C_1$ - $C_4$ alkylamino, di( $C_1$ - $C_4$ -alkyl)amino,  $C_1$ - $C_{25}$ alkanoyloxy,  $C_1$ - $C_{25}$ alkanoylamino,  $C_3$ - $C_{25}$ alkenoyloxy;

$C_3$ - $C_{25}$ alkanoyloxy which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_6$ - $C_9$ cycloalkyl-

carbonyloxy, benzoyloxy or  $C_1$ - $C_{12}$ alkyl-substituted benzoyloxy; or  $R_2$  and  $R_3$ , or  $R_3$  and  $R_4$ , or  $R_4$  and  $R_5$ , together with the linking carbon atoms, form a benzene ring; or  $R_4$  is  $-C_mH_{2m}-COR_{15}$  or  $-(CH_2)_qOH$  or, if  $R_3$ ,  $R_5$  and  $R_6$  are hydrogen,  $R_4$  is additionally a radical of formula III



wherein  $R_1$  is as defined above for  $n = 1$ ;

$R_6$  is hydrogen or, when  $R_4$  is hydroxy,  $R_6$  can also be  $C_1$ - $C_{25}$ alkyl or  $C_3$ - $C_{25}$ alkenyl;

$R_7$ ,  $R_8$ ,  $R_9$ ,  $R_{10}$  and  $R_{11}$  are each independently of one another hydrogen, halogen, hydroxy,

$C_1$ - $C_{25}$ alkyl;  $C_2$ - $C_{25}$ alkyl which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_1$ - $C_{25}$ alkoxy;

$C_2$ - $C_{25}$ alkoxy which is interrupted by oxygen, sulfur or  $\text{>N}-R_{14}$ ;  $C_1$ - $C_{25}$ alkylthio,  $C_3$ - $C_{25}$ -

alkenyl,  $C_3$ - $C_{25}$ alkenoyloxy,  $C_3$ - $C_{25}$ alkynyl,  $C_3$ - $C_{25}$ alkynyloxy,  $C_7$ - $C_9$ phenylalkyl,  $C_7$ - $C_9$ phenyl-alkoxy, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenyl; unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenoxy; unsubstituted or  $C_1$ - $C_4$ alkyl-substituted  $C_5$ - $C_8$ cycloalkyl; unsubstituted or  $C_1$ - $C_4$ alkyl-substituted  $C_5$ - $C_8$ cycloalkoxy;  $C_1$ - $C_4$ alkylamino, di( $C_1$ - $C_4$ alkyl)amino,  $C_1$ - $C_{25}$ alka-

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noyl; C<sub>3</sub>-C<sub>25</sub>alkanoyl which is interrupted by oxygen, sulfur or  $\text{>N-R}_{14}$  ; C<sub>1</sub>-C<sub>25</sub>alkanoyl-

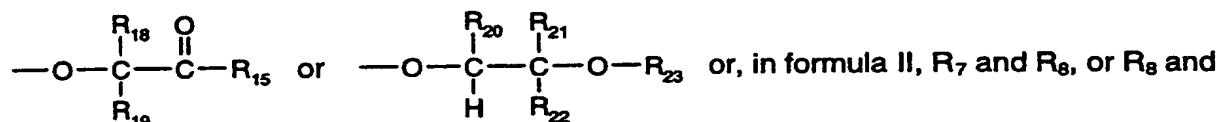
oxy; C<sub>3</sub>-C<sub>25</sub>alkanoyloxy which is interrupted by oxygen, sulfur or  $\text{>N-R}_{14}$  ; C<sub>1</sub>-C<sub>25</sub>alka-

noylamino, C<sub>3</sub>-C<sub>25</sub>alkenoyl; C<sub>3</sub>-C<sub>25</sub>alkenoyl which is interrupted by oxygen, sulfur or

$\text{>N-R}_{14}$  ; C<sub>3</sub>-C<sub>25</sub>alkenoyloxy; C<sub>3</sub>-C<sub>25</sub>alkenoyloxy which is interrupted by oxygen, sulfur or

$\text{>N-R}_{14}$  ; C<sub>6</sub>-C<sub>9</sub>cycloalkylcarbonyl, C<sub>6</sub>-C<sub>9</sub>cycloalkylcarbonyloxy, benzoyl or C<sub>1</sub>-C<sub>12</sub>alkyl-

substituted benzoyl; benzoyloxy or C<sub>1</sub>-C<sub>12</sub>alkyl-substituted benzoyloxy;

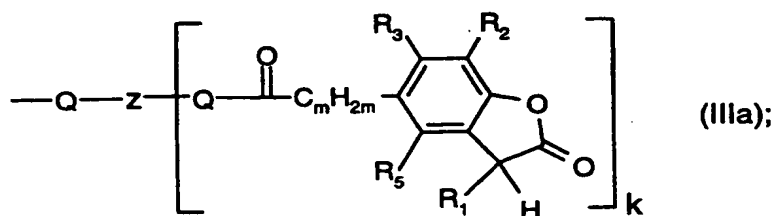


R<sub>11</sub>, together with the linking carbon atoms, form a benzene ring,

R<sub>12</sub> and R<sub>13</sub> are each independently of the other unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl-substituted phenylene or naphthylene,

R<sub>14</sub> is hydrogen or C<sub>1</sub>-C<sub>8</sub>alkyl,

R<sub>15</sub> is hydroxy,  $\left[-\text{O}^- \frac{1}{r} \text{M}^{r+}\right]$ , C<sub>1</sub>-C<sub>20</sub>alkoxy,  $-\text{N} \begin{array}{l} \text{R}_{24} \\ \text{R}_{25} \end{array}$ , or a group of the formula IIIa



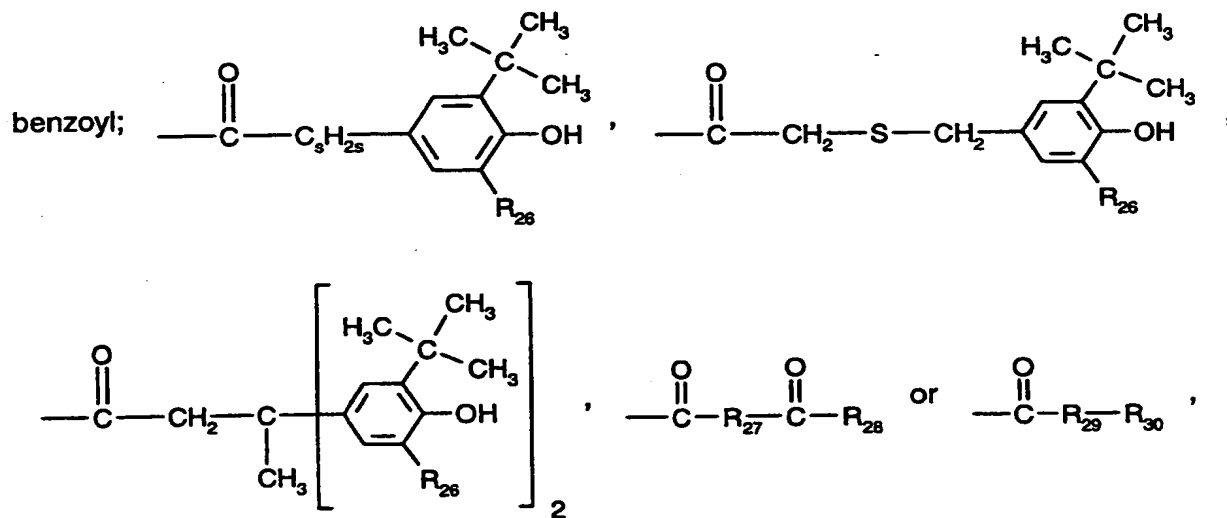
R<sub>16</sub> and R<sub>17</sub> are each independently of the other hydrogen, CF<sub>3</sub>, C<sub>1</sub>-C<sub>12</sub>alkyl or phenyl, or R<sub>16</sub> and R<sub>17</sub>, together with the linking carbon atom, are a C<sub>5</sub>-C<sub>8</sub>cycloalkylidene ring which is unsubstituted or substituted by 1 to 3 C<sub>1</sub>-C<sub>4</sub>alkyl;

R<sub>18</sub> and R<sub>19</sub> are each independently of the other hydrogen, C<sub>1</sub>-C<sub>4</sub>alkyl or phenyl,

R<sub>20</sub> is hydrogen or C<sub>1</sub>-C<sub>4</sub>alkyl,

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$R_{21}$  is hydrogen, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenyl;  $C_1$ - $C_{25}$ alkyl;  $C_2$ - $C_{25}$ alkyl which is interrupted by oxygen, sulfur or  $\text{N}-R_{14}$ ;  $C_7$ - $C_9$ phenylalkyl which is unsubstituted or substituted at the phenyl moiety by 1 to 3  $C_1$ - $C_4$ alkyl;  $C_7$ - $C_{25}$ phenylalkyl which is interrupted by oxygen, sulfur or  $\text{N}-R_{14}$  and which is unsubstituted or substituted at the phenyl moiety by 1 to 3  $C_1$ - $C_4$ alkyl, or  $R_{20}$  and  $R_{21}$ , together with the linking carbon atoms, form a  $C_5$ - $C_{12}$ cycloalkylene ring which is unsubstituted or substituted by 1 to 3  $C_1$ - $C_4$ alkyl;  $R_{22}$  is hydrogen or  $C_1$ - $C_4$ alkyl,  $R_{23}$  is hydrogen,  $C_1$ - $C_{25}$ alkanoyl,  $C_3$ - $C_{25}$ alkenoyl;  $C_3$ - $C_{25}$ alkanoyl which is interrupted by oxygen, sulfur or  $\text{N}-R_{14}$ ;  $C_2$ - $C_{25}$ alkanoyl which is substituted by a di( $C_1$ - $C_6$ alkyl)phosphonate group;  $C_6$ - $C_9$ cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or  $C_1$ - $C_{12}$ alkyl-substituted



$R_{24}$  and  $R_{25}$  are each independently of the other hydrogen or  $C_1$ - $C_{18}$ alkyl,

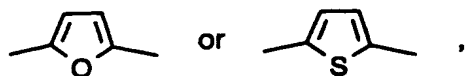
$R_{26}$  is hydrogen or  $C_1$ - $C_8$ alkyl,

$R_{27}$  is a direct bond,  $C_1$ - $C_{18}$ alkylene;  $C_2$ - $C_{18}$ alkylene which is interrupted by oxygen, sulfur or

$\text{N}-R_{14}$ ;  $C_2$ - $C_{18}$ alkenylene,  $C_2$ - $C_{20}$ alkylidene,  $C_7$ - $C_{20}$ phenylalkylidene,  $C_5$ - $C_8$ cycloalky-

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lene, C<sub>7</sub>-C<sub>8</sub>bicycloalkylene, unsubstituted or C<sub>1</sub>-C<sub>4</sub>alkyl-substituted phenylene,



R<sub>28</sub> is hydroxy,  $\left[ -O^- \frac{1}{r} M^{r+} \right]$ , C<sub>1</sub>-C<sub>18</sub>alkoxy or  $-N \begin{matrix} R_{24} \\ R_{25} \end{matrix}$ ,

R<sub>29</sub> is oxygen or -NH-,

R<sub>30</sub> is C<sub>1</sub>-C<sub>18</sub>alkyl or phenyl,

R<sub>31</sub> is hydrogen or C<sub>1</sub>-C<sub>18</sub>alkyl,

M is an r-valent metal cation,

Q is oxygen or -NH-,

X is a direct bond, oxygen, sulfur or -NR<sub>31</sub>-,

Z is a linking group of valency (k+1) and is as a divalent group C<sub>2</sub>-C<sub>12</sub>alkylene, Q-interrupted C<sub>4</sub>-C<sub>12</sub>alkylene, phenylene or phenylene-D-phenylene with D being C<sub>1</sub>-C<sub>4</sub>alkylene, O, S, SO or SO<sub>2</sub>;

Z as a trivalent group is C<sub>3</sub>-C<sub>12</sub>alkanetriyl, a trivalent residue of a hexose or a hexitol, a group  $(-CH_2)_3C-CH_2OH$ , or a group  $-C_aH_{2a}-N(C_bH_{2b})-C_cH_{2c}$ ; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol, C<sub>4</sub>-C<sub>12</sub>alkanetetryl,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12, preferably 1-6,

n is 1 or 2,

q is 1, 2, 3, 4, 5 or 6,

r is 1, 2 or 3, and

s is 0, 1 or 2;

provided that, when R<sub>7</sub> is hydroxy, alkanoyloxy or alkanoyloxy interrupted by O, S or N(R<sub>14</sub>) and R<sub>9</sub> is hydrogen, R<sub>10</sub> is not identical with R<sub>4</sub>.

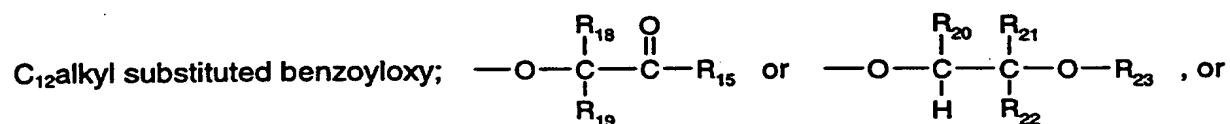
2. Process according to claim 1, wherein in the compound of formula I

$R_2$ ,  $R_3$  and  $R_5$ , independently, are H, Cl, hydroxy,  $C_1$ - $C_{25}$ alkyl,  $C_7$ - $C_9$ phenylalkyl, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenyl;  $C_1$ - $C_{18}$ alkoxy,  $C_1$ - $C_{25}$ alkanoyloxy,  $C_3$ - $C_{25}$ alkenoyloxy; and where

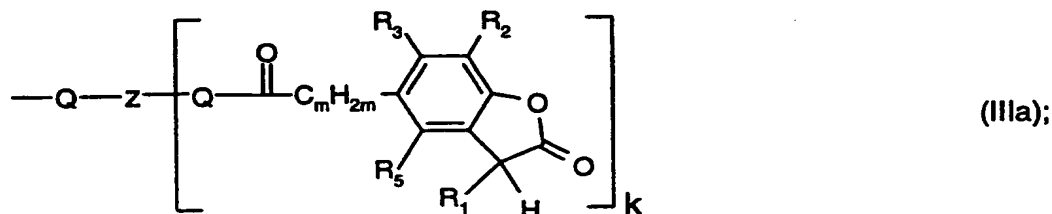
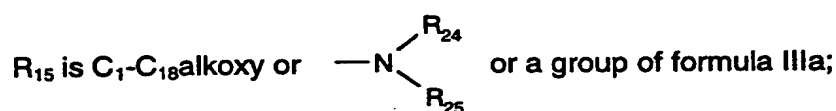
$R_4$  has a meaning as defined for  $R_2$  or is a group  $-C_mH_{2m}-COR_{15}$  or where  $R_3$ ,  $R_5$  and  $R_6$  are H,  $R_4$  may be a residue of formula III;

$R_6$  is H,

$R_7$ ,  $R_8$ ,  $R_9$ ,  $R_{10}$  and  $R_{11}$  independently are H, halogen, hydroxy,  $C_1$ - $C_{25}$ alkyl, O interrupted  $C_2$ - $C_{25}$ alkyl;  $C_1$ - $C_{25}$ alkoxy, O interrupted  $C_2$ - $C_{25}$ alkoxy,  $C_3$ - $C_{25}$ alkenyl,  $C_3$ - $C_{25}$ alkenylloxy,  $C_7$ - $C_9$ phenylalkyl,  $C_7$ - $C_9$ phenylalkoxy, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenyl; unsubstituted or  $C_1$ - $C_4$ alkyl substituted phenoxy; unsubstituted or  $C_1$ - $C_4$ alkyl substituted  $C_5$ - $C_8$ cycloalkyl; unsubstituted or  $C_1$ - $C_4$ alkyl substituted  $C_5$ - $C_8$ cycloalkoxy;  $C_1$ - $C_4$ alkylamino, di- $(C_1$ - $C_4$ -alkyl)amino,  $C_1$ - $C_{25}$ alkanoyl;  $C_1$ - $C_{25}$ alkanoyloxy;  $C_6$ - $C_9$ cycloalkylcarbonyl,  $C_6$ - $C_9$ cycloalkylcarbonyloxy, benzoyl or  $C_1$ - $C_{12}$ alkyl-substituted benzoyl; benzoyloxy or  $C_1$ -



where in formula II  $R_7$  and  $R_8$  or  $R_8$  and  $R_{11}$  together with the carbon atoms, they are bonded to, form a phenyl ring;



$R_{16}$  and  $R_{17}$  independently are H,  $CF_3$ ,  $C_1$ - $C_{12}$ alkyl or phenyl; or  $R_{16}$  and  $R_{17}$  together with the bonding carbon atom form an unsubstituted or 1-3  $C_1$ - $C_4$ alkyl-substituted  $C_5$ - $C_8$ cycloalkylidene ring;

$R_{18}$  and  $R_{19}$  independently are H,  $C_1$ - $C_4$ alkyl or phenyl;

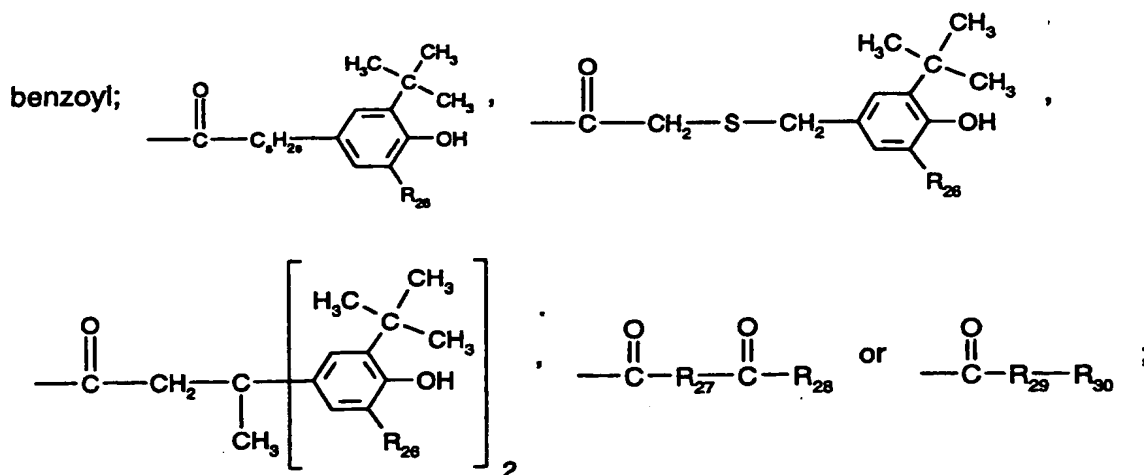
$R_{20}$  is H or  $C_1$ - $C_4$ alkyl;

$R_{21}$  is H, unsubstituted or  $C_1$ - $C_4$ alkyl substituted phenyl;  $C_1$ - $C_{25}$ alkyl, unsubstituted or on the phenyl ring 1-3  $C_1$ - $C_4$ alkyl-substituted  $C_7$ - $C_9$ phenylalkyl;

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$R_{22}$  is H or  $C_1$ - $C_4$ alkyl;

$R_{23}$  is H,  $C_1$ - $C_{25}$ alkanoyl,  $C_3$ - $C_{25}$ alkenoyl; di( $C_1$ - $C_8$ alkyl)phosphonate-substituted  $C_2$ - $C_{25}$ alkanoyl;  $C_6$ - $C_9$ cycloalkylcarbonyl, thenoyl, furoyl, benzoyl or  $C_1$ - $C_{12}$ alkyl-substituted

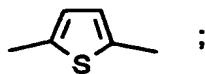


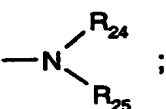
$R_{24}$  and  $R_{25}$  independently are H or  $C_1$ - $C_{18}$ alkyl;

$R_{26}$  is H or  $C_1$ - $C_8$ alkyl;

$R_{27}$  is a direct bond,  $C_1$ - $C_{18}$ alkylen,  $C_2$ - $C_{18}$ alkenylen,  $C_7$ - $C_{20}$ phenylalkyliden,  $C_5$ -

$C_6$ cycloalkylen, unsubstituted or  $C_1$ - $C_4$ alkyl-substituted phenylene,  or



$R_{28}$   $C_1$ - $C_{18}$ alkoxy or  ;

$R_{29}$  is O or -NH-;

$R_{30}$   $C_1$ - $C_{18}$ alkyl or phenyl;

M a metal cation of the valency r;

X a direct bond, O, S or -NR<sub>31</sub>-;

n 1 or 2;

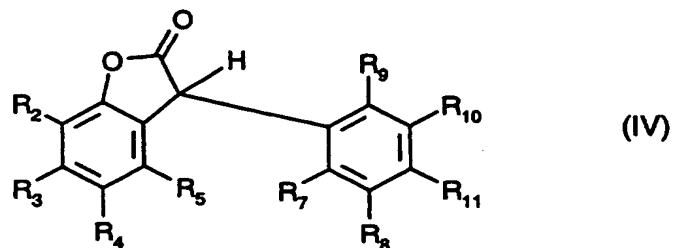
m is a number from the range 1-8;

q 1, 2, 3, 4, 5 or 6;

r 1, 2 or 3; and

s is 0, 1 or 2.

3. Process according to claim 1 wherein the compound of formula I corresponds to the formula IV



wherein

R<sub>2</sub> is H or C<sub>1</sub>-C<sub>20</sub>alkyl;

R<sub>3</sub> is H or C<sub>1</sub>-C<sub>18</sub>alkyl;

R<sub>4</sub> is C<sub>1</sub>-C<sub>6</sub>alkyl or a group -C<sub>m</sub>H<sub>2m</sub>-COR<sub>15</sub> or a group of the formula III;

R<sub>5</sub> is H or C<sub>1</sub>-C<sub>18</sub>alkyl;

R<sub>7</sub>, R<sub>8</sub>, R<sub>9</sub>, R<sub>10</sub> and R<sub>11</sub> independently are H, OH, chloro, C<sub>1</sub>-C<sub>18</sub>alkyl, C<sub>1</sub>-C<sub>18</sub>alkoxy, di(C<sub>1</sub>-

C<sub>4</sub>alkyl)amino, phenyl, C<sub>2</sub>-C<sub>18</sub>alkanoyloxy or  $\text{---O---}\begin{array}{c} \text{R}_{20} \quad \text{R}_{21} \\ | \quad | \\ \text{C} \text{---} \text{C} \text{---} \text{O---R}_{23} \\ | \quad | \\ \text{H} \quad \text{R}_{22} \end{array}$ ;

especially wherein at least 2 of the residues R<sub>7</sub>, R<sub>8</sub>, R<sub>9</sub>, R<sub>10</sub>, R<sub>11</sub> are H;

R<sub>15</sub> is C<sub>1</sub>-C<sub>18</sub>alkoxy or a group of the formula IIIa;

R<sub>20</sub>, R<sub>21</sub> and R<sub>22</sub> are H;

R<sub>23</sub> is H, C<sub>2</sub>-C<sub>18</sub>alkanoyl or a group

R<sub>26</sub> is C<sub>1</sub>-C<sub>4</sub>alkyl and

Q is oxygen;

Z is C<sub>2</sub>-C<sub>12</sub>alkylene;

k is 2;



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m is 1, 2, 3, 4, 5 or 6 and  
s is 0, 1 or 2.

4. Process according to claim 1 wherein in the compound of the formula I the bonding atom in  $R_2$  is a secondary or tertiary carbon atom and/or wherein at least one of  $R_2$  and  $R_4$  contains an ester group.

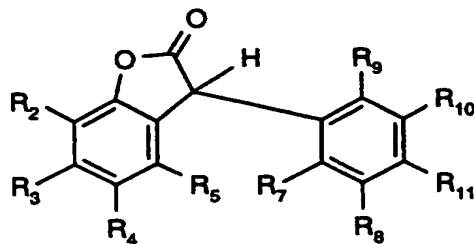
5. Process according to claim 1, wherein the compound of formula I is contained in the colour photographic material in an amount from 10 to 1000 mg/m<sup>2</sup>.

6. Process according to claim 1, wherein the compound of formula I is concentrated in one or more interlayers separating the light sensitive layers of the colour photographic material.

7. Use of a compound of the formula I according to claim 1 as scavenger for the oxidised developer in a colour photographic material.

8. A colour photographic material containing a compound of the formula I according to claim 1 as a scavenger for the oxidised developer.

9. Compound of the formula V:

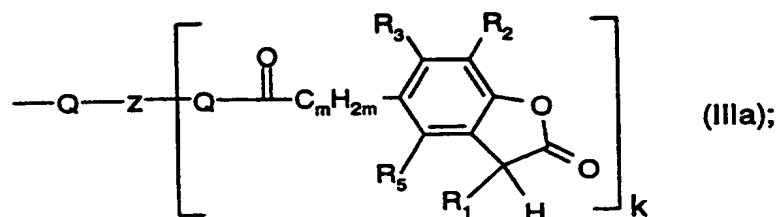


(V),

wherein

$R_4$  is  $-(CH_2)_s-COR'_{15}$  or  $-C_pH_{2p}-COR_{15}$  or  $-C_tH_{2t}-COR_{15}$ , wherein the alkylene moiety  $C_pH_{2p}$  is branched alkylene and the alkylene moiety  $C_tH_{2t}$  is a straight chain or branched alkylene moiety;

$R_{15}$  is hydroxy,  $\left[-O^- \frac{1}{r} M^{r+}\right]$ ,  $C_1-C_{20}$ alkoxy,  $-N \begin{matrix} R_{24} \\ R_{25} \end{matrix}$ , or a group of the formula IIIa



R'<sub>15</sub> is a group of formula IIIa;

Q is oxygen or -NH-,

Z is a linking group of valency (k+1) and is as a divalent group C<sub>2</sub>-C<sub>12</sub>alkylene, Q-interrupted C<sub>4</sub>-C<sub>12</sub>alkylene, phenylene or phenylene-D-phenylene with D being C<sub>1</sub>-C<sub>4</sub>alkylene, O, S, SO or SO<sub>2</sub>;

Z as a trivalent group is C<sub>3</sub>-C<sub>12</sub>alkanetriyl, a trivalent residue of a hexose or a hexitol, a group (-CH<sub>2</sub>)<sub>3</sub>C-CH<sub>2</sub>OH, or a group -C<sub>a</sub>H<sub>2a</sub>-N(C<sub>b</sub>H<sub>2b</sub>-)-C<sub>c</sub>H<sub>2c</sub>-; and

Z as a tetravalent group is a tetravalent residue of a hexose or a hexitol, C<sub>4</sub>-C<sub>12</sub>alkanet triyl,



a, b, c and k independently are 1, 2 or 3,

m is 0 or a number from the range 1-12, preferably 1-6,

p is 1 or 2;

s is 0, 1 or 2;

t is a number from the range 3-12, preferably 3-6;

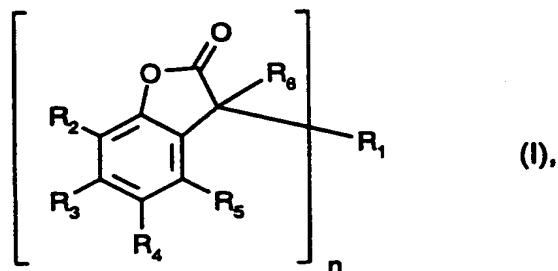
and all other residues are as defined in claim 1 for formula I if n is 1.

10. Use of a compound of the formula V according to claim 9 as stabilizer for organic material against deterioration by light, oxygen and/or heat.

11. Use according to claim 7 wherein the colour photographic material contains at least one pyrazolotriazole coupler as magenta dye providing compound.

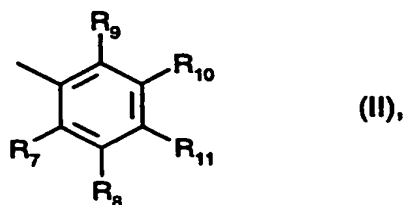
**Abstract**

A colour photographic material is described containing a compound of the formula I



wherein, if  $n = 1$ ,

$R_1$  is, inter alia, a radical of formula II



and, if  $n = 2$ ,

$R_1$  is unsubstituted or  $C_1$ - $C_4$ alkyl- or hydroxy-substituted phenylene or naphthylene; or  $-R_{12}-X-R_{13}-$ , and other residues are as defined in claim 1. Compounds of the formula I act as scavengers of the oxidised form of the developer, especially when contained in an interlayer between light sensitive layers.

